DOCUMENT RESUME

ED 446 249 CE 080 849

TITLE	Programme Development. Paper Presentations: Session F.
PUB DATE	2000-08-06
NOTE	243p.; In: Vocational Education and Training for Life Long Learning in the Information Era. IVETA [International Vocational Education and Training Association] Conference Proceedings (Hong Kong, China, August 6-9, 2000); see CE 080 842. Paper from Session F11 by Klaus Sodemann not included.
PUB TYPE	Collected Works - General (020) -- Speeches/Meeting Papers (150)
EDRS PRICE	EDRS Price MF01 Plus Postage. PC Not Available from EDRS.
DESCRIPTORS	Academic Standards; Adult Learning; Bachelors Degrees; Benchmarking; Business Education; Business Skills; Case Studies; College Programs; Comparative Analysis; Competency Based Education; Computer Software; Computer Uses in Education; Curriculum Development; Distance Education; Dropouts; Education Work Relationship; Educational Attainment; *Educational Policy; *Educational Practices; Educational Research; Educational Technology; Employment Qualifications; Engineering Education; Flexible Progression; Foreign Countries; Higher Education; Indigenous Populations; Instructional Materials; Internet; Job Skills; *Job Training; Learning Laboratories; *Lifelong Learning; Models; Outcomes of Education; Portfolio Assessment; Pretests Posttests; Professional Continuing Education; Professional Development; *Program Development; School Business Relationship; Secondary Education; Student Attitudes; Student Evaluation; Teacher Education; Teacher Evaluation; Technical Institutes; Theory Practice Relationship; Total Quality Management; Universities; *Vocational Education; Work Environment; World Wide Web
IDENTIFIERS	Australia; China; Hong Kong; ISO 9000; Sweden; Taiwan; United States

ABSTRACT

This document contains 35 papers from the program development section of an international conference on vocational education and training (VET) for lifelong learning in the information era. The following are among the papers included: "Using Quality Indicators to Create World-Class Curricula: From Concept to Application" (Curtis Finch, Timo Luopajarvi, Paivi Sutinen); "What Is Missing from ISO 9000 International Quality Standards Training in the United States?" (Paul Krueger); "West Virginia Instructional Technology Program Design for Economic Development" (Michael M. Murphy); "A Perception of the Software Process Model" (Albert H.S. Scott); "Design of Internet-Related Courses for IT (Information Technology) Professionals" (Y.K. Choi); "A TQM (Total Quality Management) Study of Faculty and Trainees' Perceptions of Public Vocational Training Institutions in Taiwan" (Li-Mei Huang); "Curriculum Development in Vocational Education: Achieving Balance and Coherence" (Christopher Parkin); "Providing Competency-Based Education for Industry and Its Effect on Classroom Education" (Chin-Yen Lin, Tsung-Juang Wang); "Competency Based Training: An Evaluation of a Post-secondary Teacher Education Program" (Dale E. Thompson, Cecelia Thompson, Betsy Orr); "Perceptions of Participants in a Multi-site

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Distance Learning Bachelor of Science Degree Program" (Betsy Orr, Dale Thompson, Cecelia Thompson); "A Study of Relation between Assessment Dimension and Management Outcomes--A Sample of Sinyi Real-Estate Company" (Stanley Tsan-Ying Lin); "Exploring a New Pattern of Vocational Education and Training" (Haicheng Yang, Tingrui Wang); "Transforming Educational Practice for a Transformed Employment Environment" (Jeanne Dawson); "Pre- and Post-Assessment in Occupational Courses" (Teresa Yohon); "Transforming Young School Leavers and Mature Unemployed into Skilled IT Workers--The IT Assistant Training in Hong Kong" (Yat-chen Li); "Discussion and Design of High Vocational Education" (Wenyi Qin, Yanchun Guo); "Teaching Statistical Problem Solving in Vocational Education" (Ken W. Li); "Structure and Cultivation of the Knowledge and Abilities of Students of Higher Vocational Technical Education" (Jiyao Zhou, Kaiyu Zhen, Weihua Liu); "Telling Stories in the Use of Portfolio Assessment in Higher Education: Some Implementation Issues" (Annie Y.W. Nicholson, Sharon Bryant); and "The Effects of the Whole Educational Experience on Graduate Employability and Further Study" (Kwok Hung Lai, Michael Hohn Pomfret). Most papers contain substantial bibliographies. (MN)

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Paper Presentations

Session F

Programme Development

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Vocational Education and Training for Life Long Learning in the Information Era

IVETA Conference 2000 Proceedings

Hong Kong

6 - 9 August 2000

USING QUALITY INDICATORS TO CREATE WORLD CLASS CURRICULA: FROM CONCEPT TO APPLICATION

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Index: Curriculum Quality Indicators, World Class Workplace,VET Curriculum Development, Higher Vocational Education

Abstract: In this paper, Curriculum Quality Indicators (CQIs) are described including what they are, how they are developed, and how they can be used to help create curricula that meet world class employers' needs. The world class workplace is presented as a frame of reference for curriculum quality. Next, details about how a set of CQIs was developed is described. The application of CQIs to a comprehensive curriculum project at Helsinki Polytechnic in Finland is the detailed. Several implications are offered for CQI use in vocational higher education curriculum development.

OVERVIEW AND PURPOSE

One particularly vexing problem associated with VET curriculum design and delivery is the selection of curriculum outcomes that are of value to all stakeholders. This is of major importance for curricula that focus on preparing people for employment in high performance workplaces, world class workplaces, and other workplaces where every work day brings with it another change, a different challenge, and an opportunity to learn something new. In these environments, employees may work in self-directed teams and solve complex problems extending beyond traditional country and cultural boundaries (Finch & Dettmann, 1999). This continuously evolving work environment reflects what Spady (1994) refers to as a transformational zone where employees are expected to demonstrate complex role performances in real-world contexts. Traditionally, work performance of this type has been considered beyond the scope of formal education. But with the evolution of more complex work environments where complex, multi-faceted demands are placed on employees; educators can no longer continue to just provide their students with the development of "discrete content skills, structured task performances, and higher-order competencies (Spady, 1994, p. 21). When Curriculum Quality Indicators (CQIs) are used as part of the curriculum creation process, they have the potential to help move educators and others into transformational zones where they can focus their curricula on today's and tomorrow's increasingly complex world class work environment. The purpose of this paper is to describe

Curriculum Quality Indicators: what they are, how they are developed, and how they can be used to help create curricula that meet world class employers' needs. First, the world class workplace is presented as a conceptual frame of reference for curriculum quality. This is followed by a description of how a set of CQIs was developed. Then, the application of CQIs to a comprehensive curriculum project at Helsinki Polytechnic in Finland is described. Several implications are offered for CQI use in vocational higher education curriculum development.

CURRICULUM QUALITY INDICATORS: CONCEPTS

A Frame of Reference for Curriculum Quality

Over the past several decades, many businesses and industries throughout the world have been faced with the need to change from traditional workplace arrangements to workplaces that compete head-to-head with world class competition. With reference to the United States, the National Alliance of Business (1999, 1) noted, "rapidly changing technology, the globalization of markets, and other changes sweeping through the U.S. economy mean that our long held assumptions about the economy and business are changing." In response to a need to be more competitive, numerous organizations have shifted focus from a traditional workplace model to a world class workplace model. This shift has caused employers and their employees to change the ways they are organized and function. Changes have occurred internationally in fields ranging from hospitality and tourism to "fast" food and other areas of retail sales, however, they have most dramatic and far reaching in the manufacturing and information technology (IT) fields.

What is the World Class Workplace? An extensive examination of Internet sites and text-based publications resulted in at least a partial answer to this question (Finch & Dettmann, 1999). Definitions may vary from employer to employed depending on what is produced, provided, or sold. However, the concept and its application are perhaps most important than the name. The world class workplace can be more transparent, by serving as the ultimate objective of a long term TQM effort or the real reason behind seeking registration as an ISO 9000 organization. It can also take the spotlight, such as a company or organization that prepares a mission statement announcing "we meet customers' needs worldwide" or "we prepare our graduates for employment in world class businesses and industries." Lacking a simple definition, it is perhaps best to offer several commonly used descriptors. Thus, the world class workplace:

- can be found in a variety of workplaces including but not limited to those engaged in manufacturing, production, marketing, distribution, sales, service, education, and training.
- can be integrated and correlated with TQM and/or ISO 9000 activities.
- depending on the focus of organization, can include just-in-time delivery, performance specifications, mass customization, continuous quality improvement, and similar types of activities.
- can engage employees in flexible work assignments; group planning, problem solving, and decision making; team building, and similar types of activities.
- expects employees to utilize a wide range of interpersonal, academic, and technological skills; understand what occurs in the workplace as a whole; and demonstrate similar types of talents.

Ultimately, the world class workplace makes creative and extensive use of numerous human resources, materiel resources, quality and productivity activities, and related strategies to systematically maintain a competitive edge in the global work environment.

Evolution of the world class workplace may be found in many work fields but change has been perhaps most graphic in the manufacturing field where lean production has displaced

traditional mass production processes. Essentially, lean production has as its goals lower cost and higher quality production. However, it is the production process that achieves these goals. Included in the lean production setting are just-in-time delivery of parts, use of performance specifications for parts, an assembly line that any worker may stop at any time and, most important, focus at all production levels on continuous improvement. In some cases, the assembly line form of production has been completely eliminated (Ellegard, Engstrom, & Nilsson, 1991). Lean production workers function as members of production teams, have flexible work assignments, and are expected to initiate improvements to production rather than merely reacting to problems (Womack, Jones, & Ross, 1990). Unlike the mass production employee, the lean production worker is expected to work as a team member, perform a wide variety of activities and tasks, participate in group problem-solving sessions, and otherwise contribute to the total production process and the quality outcomes of that process. This employee is expected to be proactive, have a grasp of the entire production process, and have a solid grounding in basic skills (i.e., mathematics, science, communication). Mastery of these basic skills enables the worker to more readily adapt to changes in the workplace. Realistically, this new type of worker should arrive at the workplace with these basic skills, as well as others such as interpersonal relations that contribute to success in the lean production environment. In a number of cases, lean production has evolved into mass customization; an organic organizational structure that has enabled businesses and industries to achieve "low costs, high quality, and the ability to make highly varied, often individually customized products" (Pine, Victor, & Boynton, 1993, p. 111). Mass customization has made it possible for more and more companies to compete on the world marketplace.

CQI Description and Development[1]

Given the increasing complexity of the workplace and the evolution of its focus from local, state, and national to world class competition, a need exists to extend beyond the strict reliance on curriculum development methods that identify important tasks and skills. The complex nature of workers' roles in the world class workplace demands that VET curricula be designed to prepare graduates so they will function in new and complex ways. Briefly stated, CQIs may be considered as the "super glue" that binds curriculum components together such that quality can be assessed both comprehensively and in the long term. Indicators can assist curriculum developers to obtain a macro view of the curriculum and thus see how the curriculum they are developing or revising can best contribute to students', graduates', and employers' expectations (Finch, 1993). One example of CQI development began over 20 years ago when a book on curriculum development was first being prepared. At that time it was felt important to include in the book a set of overarching qualities that would aid curriculum developers in going beyond the process-oriented goals found in most traditional curricula. As newer editions of the book were prepared, the qualities were examined and refined based on input from curriculum developers and others in the US and 10 other countries (Finch & Crunkilton, 1999). When working during the fall of 1993 with developers of curricula at Jyväskylä Polytechnic (at that time a new vocational higher education institution in Finland) the list of qualities was expanded and quality indicators were prepared. Persons at the polytechnic who used the CQIs felt they aided in focusing on more critical curriculum concerns and outcomes. Subsequent use of the CQIs in interviews with persons in VET institutions in four different countries further supported the indicators' value. Although refinement continues, the CQIs constitute a useful way of determining what curriculum quality should be and how it can be implemented.

[1] A list of CQIs that link with the world class workplace may be obtained from Curt Finch <crfinch@vt.edu>.

CURRICULUM QUALITY INDICATORS: APPLICATION

Helsinki Polytechnic

The Finnish higher education system consists of polytechnics and universities. At the beginning of the academic year 2000-2001 the number of permanent polytechnics in Finland will rise up to 29. Helsinki Polytechnic was established in 1996 by merging eight existing institutions of higher education maintained by the City of Helsinki. The new organisation was officially launched 1 January 1999 when these separate institutions were abolished. The process was completed by adding four new institutions, the last two in August, 2000. All these institutions, at present integrated, had long traditions in teaching, with experience going back many decades. They educated competent engineers and nurses, among others. Before the integration, guidelines for developing curricula followed traditional curricula theories; for example, in the field of technology they were close to German Lehrplan and in the social services Anglo-Saxon traditions. As one of the largest polytechnics in Finland, Helsinki Polytechnic has over 6,000 full-time students and close to 900 part-time students. Helsinki Polytechnic has three faculties: Technology and Transport, Health Care and Social Services and Cultural and Services. Helsinki polytechnic awards professionally orientated higher education degrees, which take 3.5-4.5 years to complete (140-180 credit units). The structure of all degree programs consists of basic studies (common and discipline-specific), professional studies, practical training, language studies, elective studies and final project (Bachelor's thesis).

The Faculty of Culture and Services offers studies in seven (7) degree programs from Beauty Care and Catering Services to Media, from Drama and Theater to Pop/Jazz and Classical Music. At the Faculty of Health Care and Social Services Helsinki Polytechnic is proud to offer students studies in all the degree programs available at the Finnish polytechnics. Studies in fifteen (15) degree programs include e.g. Nursing and Health Care, Occupational Therapy, Optometry and Oral Hygiene. The five (5) degree programs at the Faculty of Technology and Transport include Electrical Engineering and Telecommunications, Mechanical Engineering, Civil Engineering, Automotive Engineering and Laboratory Sciences (Helsinki Polytechnic, 2000).

Helsinki Polytechnic intends to be internationally acclaimed for the high standards of its educational programs whose students become employed immediately after graduation. The strategic aims of Helsinki Polytechnic consist of enhancing the polytechnic's international activities, improving the level of professional expertise, increasing the cooperation both inside the organisation and with its partners, and developing the urban culture in Helsinki.

Curriculum Development, Phase 1 (1999-2000)

The institutions of higher education that formed Helsinki Polytechnic brought with them different traditions and approaches to developing curricula. Thus, a project was launched in 1999 to determine common aims and strategies for all the curricula and to improve their quality. The purpose of this project was to ensure that each curricula for each of the 26 degree programs would offer students the necessary skills and capacities to work as solid experts of their respective fields in current and future international labor markets (world class workplace). A project team was appointed to take the responsibility for organizing the project. Also, one of the lecturers in each degree program was put in charge of a working group formed to examine and revise that curriculum . Assigned lecturers led groups of 3 to 6 other lecturers. In total, close to 180 lecturers were actively involved in the project. The main working methods during the project consisted of systematically

organized discussions between staff members at the polytechnic, its different units, students, and partners in the working life.

As the project began, it was important to form a common view on the notion of a curriculum. The basis for this was the presupposition that a curriculum should be the fundamental framework for all activities within the polytechnic. Thus, this does not mean only writing down the curriculum but also judging its effective implementation and conducting continuous improvement. From the beginning, the aim was to create common terms and concepts to use for all the curricula without forgetting the special features and expertise of each degree program. This was essential for realizing the requirements set by future working life and enhancing the possibilities to meet them.

Next, it was necessary to define three strategic aims for developing the curricula. They included:

1. The curricula will meet the requirements set by future's working life and area of operation and act according to them. Thus, the critical factors for attaining this involve: activities based on ethics, responsibility and commitment; team work skills and know-how; expert knowledge; information processing; sustainable development; entrepreneurship and internationality.
2. The curricula will be based on solid expertise of each field and they provide students the means to work as experts. This involves basing the curricula upon the most recent and essential information of each field, accentuating the logic in contents and continuity, and integrating theory with practice.
3. The curricula will be implemented according to the notion of learning particular to Helsinki polytechnic. This implies that each student has the possibility to create an individual curriculum based on his/her earlier knowledge and skills. This requires the continuous development of student and staff skills and knowledge and methods of teaching that emphasize active learning.

During the process of refining these strategic aims and planning the continuation of the whole developing project, the Curriculum Quality Indicators (CQI) were used as reference to ensure that the curricula under development would provide the students with the necessary skills and knowledge needed in the world class workplace. Additionally, evaluation of the project's first phase was and the forthcoming phases will be based on the CQIs.

Each curriculum should achieve the stated strategic aims by year 2004. The progress will be estimated annually as a part of the continuous development process in cooperation with the working life, students and researchers of the future at different fields with the help of the Curriculum Quality Indicators. In the first phase of the project, common ground was established to enable the continuous development of each curriculum. The process was carried out through a set of questions formed to ensure that each curricula would meet the requirements set by the World Class Workplace. The next phase will take place in 2000-2001. The work will proceed within the framework created during the first phase and emphasis will be on the strategic aims defined according to the needs of each degree program specified during the first phase.

Elaboration of the curricula was based on a dialogue between the project team and the working groups set for each degree program that used the Curriculum Quality Indicators as a starting point. The project team and all the lecturers who were in charge of the development work took part in these discussions. Project work proceeded through a series of questions and reasoning using the theme areas for the Curriculum Quality Indicators as organizers and the following issues/questions as focal points:

Basic Decisions, Needs, Students, Emphasis on the Future

1. What skills and abilities does the future's working life and area of operation expect of an expert in a field, and why? What does a student expect of his/her education, and why?

2. What kind of curriculum meets these expectations, and why?

3. How can an individual curriculum be implemented, and why?

Outcomes, Flow and Linkages, Application, Students, Value Added Emphasis

4. How does practical training fit in the curriculum, and why?

5. What is the structure of a curriculum like, and why?

6. What kind of expertise does a curriculum require of the staff, and why?

7. What will be the major changes in the curriculum, and why?

The CQI theme areas and world class emphasis will be assessed further and linked more closely to the curriculum development process during the project's next phase.

The project team evaluated the achievements of the first phase and discovered the following:

- Persons involved in the project achieved a comprehensive picture of different degree programs at the polytechnic and found new ways to cooperate. A genuine development work process begun.
- It was possible to create a new, common strategy for developing the curricula that respects differences. A clear framework for developing the curricula was established.
- Persons involved in the project found a common enthusiasm and interest in developing curricula together. An "interactive chaos that creates something new" stimulated new innovations and projects.

In its entirety, the development project strengthened the assumption that curricula can be developed to meet the requirements set by future's working life only by respecting existing differences between the degree programs, strengthening their expertise and working together. Thus, for an expert organization to succeed in the future, it will not only need solid expertise but also well-established cooperation and multidisciplinary networks that cut across traditional boundaries of expertise.

IMPLICATIONS

Several implications for vocational higher vocational education curriculum development may be drawn from this discussion. First, large scale curriculum development projects need to be planned in advance and for the long term. Advance planning combined with the recognition that change will not occur overnight can go a long way toward developing quality curricula. Second, curriculum change across an entire institution requires active support from higher administration and active involvement by faculty and staff at all levels. If this does not occur, it is likely that faculty and staff will not feel they have ownership of the process or the product. Third, the use of quality indicators can aid faculty members in understanding the macro and long-term aspects of the curriculum. This understanding can, likewise, lead faculty members to view the curriculum as more than a series of subjects taught in one program. Ultimately, however, success in institution-wide curriculum reform can help make the whole institution become more than the sum of its parts.

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WHAT IS MISSING FROM ISO 9000 INTERNATIONAL QUALITY STANDARDS TRAINING IN THE UNITED STATES?

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Index: Quality Training, International Standards, Instructional Strategies

Abstract: Carnevale, Gainer and Villet (1991) observed that employers have too often used training approaches that failed to deliver "new knowledge in a context meaningful to the learner." This conclusion was consistent with the results found in a recent study of 406 United States companies that used training to prepare their employees for registration to the ISO 9000 series of international quality assurance standards. The vast majority of companies failed to address employee learning needs, and used few research-based instructional strategies to enhance training transfer from workshop to shop floor. Companies rarely grouped employees by their ability to learn and infrequently used the instructional strategies of analogies, behavioral objectives, imagery, and practice and feedback.

More startling than the lackluster use of these instructional strategies were the results obtained for management commitment. Although workforce training was required by the ISO 9000 standards, and failure to meet this requirement would threaten the quality registration status of companies, there was a general lack of management commitment to training found in this nation-wide survey.

This paper is important because it reveals many shortcomings of training practices by companies engaged in international trade and registered to the ISO 9000 standards. Furthermore, it suggests that grouping employees by their ability to learn may function to enhance the implementation of instructional strategies in such a way as to improve training transfer and reduce nonconformances against the international standards.

INTRODUCTION

Workforce training was required by the ISO 9000 Series of International Quality Assurance Standards. Although important, there were no formal inquiries found that described how companies met the training requirements of these European originated standards. Rather, numerous trade publications were found in a review of the literature that prescribed anecdotal, ad hoc practices that failed to exhibit theoretically sound, research informed instructional methods.

ISO 9000 trade books and magazine articles only reiterated the standard's requirement for training. They did not inform training practices in a way meaningful to workforce training designers and learners. "Training" was defined "in a very broad sense," and included "formal courses and seminars, in-house classroom instruction, in-house practical training, etc."(Kanholm, 1992). All employees were to be "educated" on ISO 9000 through repeated communications in a newsletter, instruction on how to deal with an auditor, and through multiple wall postings of the quality policy (Rabbit and Bergh, 1993). A "formal ISO training syllabus" was to be established, which was to outline training intended to be "not lengthy, just a good overview, supported by transparencies, covering basically what ISO 9000 was" (Johnson, 1993).

THE STUDY

To address this lack of formal inquiry, a random sample mail survey of all private sector organizational sites in the United States registered to the ISO 9000 series of standards from 1987 to 1997 was conducted (Krueger, 1999). From the sample of 736 company sites drawn, a total of 420 companies participated (57%) in this Fall 1997 survey, which surpassed the needed size of 368 company sites to be within $p<.05$ of the population proportion with a 95 percent level of confidence (Isaac and Michael, 1997). Of those 420 participants, 14 reported that no ISO 9000 training had been conducted, which left 406 remaining for analysis in this study.

The survey questionnaire had six-point ordinal scale measures of management commitment to training, employee learning needs, instructional strategies, and training transfer. Management commitment has been seen as a prerequisite to organizational change (Joshi, 1998), and provided favorability or unfavorability cues about training to workers. Time allowances for training served as cues (Tessmer and Richey, 1997), and were measured in this research in terms of workload reductions and production deadline extensions intended to compensate workers for time devoted to training.

Learning was seen as progressive (Gist, 1997), consequently, needs assessment of prerequisite knowledge, skills and abilities was considered an important precursor to new learning and the design of training programs (Goldstein, 1993). For the purposes of this study, the extent to which employees were separated into groups by their ability to learn was measured.

Instructional strategies that used analogies and imagery were cognitive approaches that viewed the learner as actively involved in the learning process. The learner "thinks" and has internal cognitive processes that functioned to mediate the receipt, transformation, storing, retrieval and use of information (Dembo, 1991). These compared with ones that were more behavioral in nature, including the use of behavioral objectives, and practice and feedback. In this latter case, the learner was viewed as passive and learning as a function of reward. Learning occurred when stimulus-response connections were rewarded, and transfer of this learning was facilitated when training conditions approximated the situation where they were used (Goldstein, 1993).

Indicators of near and far transfer, and the number of nonconformance citations by a third party auditor measured the outcomes of training. Near transfer occurred when the consequences of training routine, job-specific "how to do" skills were highly similar to the job situation for which they were intended. To measure this, companies were asked to report the extent to which trainees were able to implement specific ISO 9000 quality procedures after training. Far transfer occurred when the consequences of training non-routine, "how to think" methods were appropriate for the complex and constantly changing nature of the job situation for which they were intended (Clark, 1992). To measure far transfer, companies were asked to report the extent to which trainees were able to explain how the new ISO 9000 quality system worked for the overall organization.

RESULTS

Management commitment to ISO 9000 workforce training was measured using the two indicators of production deadlines and employee workloads. For comparison purposes, only the bipolar extremes of the scale were reported here. Specifically, 56.8% of company sites reported the production deadlines were never extended for employees in order to compensate for the time devoted to ISO 9000 training. This compared with only 2% of companies that always made these training accommodations. This tendency was similar for the indicator that measured the extent to which workloads of employees were reduced in order to compensate for training time. For this

measure of management commitment to training, 41.6% of company sites reported never to have reduced workloads, while only 3.2% always did.

Company sites were asked to report to what extent employees were separated into groups by their ability to learn. The vast majority of sites (82.3%) reported that they never separated their employees in terms of this measure of training needs assessment.

To further assess the effects of ability grouping, Spearman rho rank-order correlation statistics were calculated for those companies that always or frequently separated their employees by their ability to learn in comparison to those that sometimes or never did. The reduction in nonconformances associated with the training techniques of behavioral objectives (-.723), imagery (-.512), analogies (-.505), and practice and feedback (-.481) were not only statistically significant at the $p<.05$ level, but far exceeded the slight correlations obtained by those companies that reported to have never or sometimes separated employees by ability when using these instructional strategies (i.e., correlations ranging from -.109 to -.147).

Behavioral objectives as an approach were measured by the extent to which specific objectives were used to guide training; i.e., precise written statements of what the employee will be able to do as a result of training. Companies tended to cluster towards the never or sometimes end of the continuum 64.4% of the time, with only 5.7% of companies reported to have always used objectives to guide ISO 9000 training. Slight but statistically significant Spearman rho correlations were obtained, positively with near transfer (.177, $p<.01$) and far transfer (.235, $p<.01$), and negatively with the number of nonconformances (-.128, $p<.01$).

Imagery was measured in this study by the extent to which employees were given instructions to form a mental picture of the quality system, imagining how it works. Once again companies tended to cluster towards the never to sometimes end of the continuum 65.5% of the time, with only 6.4% reporting to have always used this cognitive instructional strategy. The slight but significant near (.143, $p<.01$) and far (.213, $p<.01$) correlations were also evident, except when employees were grouped by their ability to learn. In the case where companies reported that they always or frequently used ability grouping, near (.480, $p<.05$) and far (.655, $p<.01$) transfer increased markedly in their association with imagery.

Analogies, which compared the quality system to the common, every day life of employees, appeared more frequently in company training. Their use tended to cluster towards the middle of the scale, with 86.5% reporting in the sometimes to frequently range. Analogies obtained slight, significant correlations with near (.121, $p<.01$) and far (.228, $p<.01$) transfer, but a more pronounced correlation with near transfer (.459, $p<.05$) when ability grouping was frequent to always used.

Similar to analogies, practice and feedback occurred in training more often. They were measured by the extent to which employees practiced the new procedures during training and received feedback from trainers. Companies tended to cluster towards the middle of the distribution for this measure. They were significantly correlated with near (.278, $p<.01$) and far (.245, $p<.01$) transfer, but once again benefited when companies reported ability grouping. Separating employees by their ability to learn frequently to always resulted in an increased association between near (.638, $p<.01$) and far (.458, $p<.05$) transfer and the practice and feedback instructional strategy.

DISCUSSION

Grouping employees by their ability to learn appeared to be an important result to emerge from this study. Companies that reported this practice frequently to always obtained stronger, positive correlations between their instructional strategies and near and far transfer, than organizations that never or sometimes practiced this method. These results appeared consistent with the substantially larger negative correlations obtained between instructional strategies and the number of nonconformances cited against companies; i.e., increased ability grouping, when implementing instructional strategies, was associated with decreased nonconformance citations by third-party auditors.

Few companies used the instructional strategy of ability grouping and represent an area for concern. Unskilled and semi-skilled entry-level workers have not reached the levels of competency evidenced by skilled workers and professionals. Prerequisite knowledge and skills have served as precursors to advanced learning. Is it reasonable to expect a first grader placed with eighth graders to perform as well?

The commitment of management to the support of ISO 9000 workforce training, as measured by the production deadline and workload reduction indicators, was another serious concern. Comments appeared on several of the surveys that addressed this problem from the perspectives of the questionnaire respondents. ISO 9000 workforce training was "not initially looked at as favorable by management" and "still does not support it fully," being "viewed as a unnecessary investment" that "was dictated by headquarters." Some workers consequently saw ISO 9000 "as another flavor of the month activity."

Of course caution should be exercised when interpreting these results. Some limitations may arise from the nature of correlational research, standardized surveys, cross-sectional designs, ordinal data, and the use of nonparametric statistics.

Correlation was not causation (McMillan, 1996). The statistically significant correlations reported in this study represented necessary but not sufficient conditions to establish cause-and-effect relationships between instructional strategies and training outcomes.

Standardized survey questionnaire items were limited to the extent that they were approximate indicators of training behavior, potentially simplifying complex phenomena for measurement purposes. Measurement was limited by the small number of measures that were standardized, largely closed-ended and quantitative (Babbie, 1998).

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WEST VIRGINIA
INSTRUCTIONAL TECHNOLOGY PROGRAM DESIGN
FOR ECONOMIC DEVELOPMENT

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Index: Skill Training, Distance Learning, Economic Development, Information Technology

Abstract: The expansion of technology throughout the entire technical education spectrum is linked to the successful implementation, integration and support of the new educational paradigm. Education must build on a strong technical infrastructure. Common strategies in physical infrastructure connectivity, philosophies, training and support will build the firm foundation upon which all other advances can be successfully sustained. West Virginia technical education must move in a sound collaborative mode that improves workforce preparedness. No matter where the company is located, workforce development is a vital component of the overall strategic economic development plan and must occur concurrently with development efforts, distance learning may be a key to training delivery. Industry consistently indicates that certification is much more important than college degrees. College and universities should look to inclusion of these certification skills into their degree programs. The formation of this delivery model will involve a cooperative effort of the State Colleges, Universities, Community Colleges and Technical Education Centers.

PHILOSOPHY – INFRASTRUCRURE - COLLABORATION

The expansion of technology throughout the entire technical education spectrum is linked to the successful implementation, integration and support of the new educational paradigm. Education must build on a strong technical infrastructure. Common strategies in physical infrastructure connectivity, philosophies, training and support will build the firm foundation upon which all other advances can be successfully sustained. West Virginia technical education must move in a sound collaborative mode that will improve workforce preparedness.

EMPLOYMENT/TRAINING PARADOX

Training for workforce development continues to be faced with the chicken and egg paradox. Do we train for existing and expanding industries or do we train to attract new industries. Historically the skills needed for manufacturing construction and service industries have been more stable than those emerging in the Information Age. Bricklaying, for example, has not changed basic skills significantly over the last 50 years. Our Gifu Japan Office has indicated to us that the life of a computer game is now estimated at one month by Japanese software developers. Obsolescence of technology is growing at an ever-increasing rate due to advanced development and user expectations. Computers, for example, have generally been placed on a three-year replacement cycle. A three-year old computer is probably still usable and is physically and electronically sound but will not run the software needed to be competitive for the business enterprise environment.

"JUST IN TIME TRAINING"

As West Virginia's employers adjust to the challenges of technological change and the need to develop a globally competitive workforce, the use of technology as an instrument to enhance the delivery of technical education's workforce development programs, is becoming increasingly necessary. The demand for a "just-in-time" workforce development delivery system in a competitive client-driven environment challenges education to become more creative in utilizing technology to satisfy these needs. Traditionally training institutions have not been proactive in providing cutting edge training. Perhaps this type of training should be conducted by industry?

GOVERNMENT – EDUCATION – INDUSTRY COLLABORATION

Government, industry, and business in West Virginia are moving rapidly toward the Information Age. The State of West Virginia made significant strides toward delivery of services and government functions through information technology as evidenced by the Information Technology Strategic Plans located at www.state.wv.us. Federal government installations in West Virginia (such as the Federal Bureau of Investigation Fingerprint Lab, Internal Revenue Services Area Processing Centers, and Public Debt Office) also contribute to the WV information technology base. Information technology industries are being promoted and are growing as a result of the National Technology Transfer Center (www.nttc.edu), the West Virginia High Technology Consortium Foundation (www.wvhtf.org), the West Virginia Development Office (www.wvdo.org), and the Governor's Office of Technology Japan Office (www.wv-jpnet/got/default.htm). These developments are part of the overall plan to groom the West Virginia economy through information technology. The High Tech Consortium is offering a Virtual Company service, which can link companies through the internet in a corporate relationship any where in the world. No matter where the company is located, workforce development is a vital component of the overall strategic economic development plan and must occur concurrently with development efforts. Industry consistently indicates that certification is much more important than college degrees. Cisco, Novell, and Microsoft certifications are valued by industry. College and universities should look to inclusion of these certification skills into their degree programs.

UTILIZING TECHNOLOGY FOR SELF DIRECTED LEARNING

The present state of technology permits us to reestablish the self-directed learning method as a part of an instructional alternative offered by technical education. For the student who learns more effectively in this manner, multimedia, technology-assisted web-based courses could provide the opportunity to recapture the love of self-directed learning. Although research might not be available which supports technology as being the missing link in learning methodologies, the US National Science Foundation has targeted many funds, which will be used to investigate this new opportunity. Most certainly, with technology, WV can begin to provide again the possibility of getting the credentials or the skills necessary for productive, fulfilling, and responsible work. Technology can and should be applied to make the promise of an education a reality for those who need this new chance to participate fully in society. Development education and workforce preparedness are logical targets of the technology. Technology focused in this manner, cannot be challenged as effectively increasing access, meeting student needs in an environment which is insensitive to the barriers of semester beginnings and semester endings, and which can identify, without prejudice, the strengths and shortcomings of the individual learner.

Technology can easily accommodate the individual who learns quickly. This is a commonly accepted reason for adopting technology. Less commonly recognized is that many students, who learn more slowly, can benefit from the technology-assisted approach. A web-based presentation can be reviewed as many times as necessary for understanding.

QUALITY CONTENT

We must not loose site of our objective when providing work force training. It is easy to get lost in the blur of technology and forget that technology is the media not the message. History has repeated itself with digital technology much like print, audio, and video technologies. Early on too much emphasis is given to the technology rather than the content and application. Fortunately, digital technology is emerging from the beginning stages to a stable environment as evidenced by the quality of programming available from educational institutions and especially industries like Microsoft, Cisco, and other major IT vendors.

VIRTUAL CURRICULA

As statewide efforts to deliver workforce development programs involving several different public institutions proceed, asynchronous learning which utilizes the Internet, the ATM infrastructure, multimedia, and other forms of technology can provide delivery in a more cost effective, accessible, and efficient manner. The development of curricula utilizing a variety of technology assisted delivery models will become the norm. In addition, significant professional development efforts must be undertaken to encourage interested faculty in becoming proficient in creating technology assisted courses, which employ a "virtual curriculum" model that will deliver course content in "chunks". This type of delivery system will be absolutely necessary to meet the time constraints of workers and employers alike. The use of the Instructional Performance System Inc (IPSI) software suite, which is a structured approach to curriculum development utilizing the "virtual curriculum" and "chunking of content" concepts, is presently being utilized by West Virginia's public higher education institutions delivering community and technical college education. The use of IPSI needs to become more widespread in order for faculty to develop curricula that provide for the workforce readiness demanded by employers. This type of development and delivery by selected faculty should create an environment more conducive for the transfer of knowledge to other faculty. This will encourage more utilization of this method in the delivery of the regular curriculum, and will thus result in systemic changes as to how workforce programs are delivered.

ELECTRONIC INFRASTRUCTURE

West Virginia has made great strides in building the infrastructure to deliver digital based training throughout the State by development of the West Virginia State Unified Network (WVSUN [www.state.wv.us/got/wvsunplan]) for carriage of signal for all state agencies, including K-12 and higher education. WVSUN by utilizing Asynchronous Transfer Mode (ATM) technology will be able to provide voice, video, and data needed to transmit distance learning effortlessly. West Virginia will continue to capitalize on other states and countries developments. Over 600 college courses are now available through the Southern Regional Education Board (www.sreb.org). Over 400 Computer Based Training courses (CBT) were made available through WVSUN (www.wvnet.edu). In

addition, West Virginia University (www.wvu.edu) Marshall University (www.marshall.edu) along with other colleges, community colleges, and technical schools continue to offer technology training through distance learning venues.

CONCENTRATION

Over the next few years, four different programmatic areas will be addressed for application of asynchronous learning and the virtual curriculum model for the delivery of workforce development programs. These areas are Manufacturing Supervision, Manufacturing Technology, Emergency Medical Services and select Governor's Guaranteed Workforce Program training modules. The goal is to develop curricula in Information Technology, Identification Technology, Virtual Reality Technology, Manufacturing Supervision, Manufacturing Technology and Emergency Medical Services in the IPSI format and making them available to all West Virginia educational institutions involved in the delivery of these programs. Selected courses in each program will be put into a technology assisted delivery mode. In addition, those Governor's Guaranteed Workforce Program training modules that are in the most demand and lend themselves to technology-assisted delivery will be put in that mode and made available to members of the West Virginia Training Network.

COOPERATIVE EFFORTS

The formation of this delivery model will involve a cooperative effort of the State Colleges, Universities, Community Colleges and Technical Education Centers. In addition the Human Resource Investment Council, the Work Force Investment Boards, the West Virginia Development Office and various business partners including the West Virginia Manufacturers Association and the West Virginia Roundtable.

A PERCEPTION OF THE SOFTWARE PROCESS MODEL

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Index: Perception; software; product; process; students; quality attributes

Abstract: A student's perception of a software development process model appears to be a series of milestones when documentation is produced to satisfy academic requirements. Certain academic and industrial practices may influence students to place more emphasis on the software product than the process model.

The proposal presented is to establish a more structured approach to project supervision to ensure a student performs quality planning, which includes the identification of appropriate software product quality attributes. Such an approach may ensure that sufficient attention is given to the software development process model to ensure that desired software product quality attributes are achieved.

INTRODUCTION

A student, who seeks vocational training, rather than undergraduate studies, normally has an aptitude for doing practical tasks. A major piece of work that computing students undertake is an individual software development project. The development of good quality software requires the adoption of a disciplined approach to all the tasks involved. This approach is in the form of a chosen methodology based upon a particular software development process model.

DEVELOPMENT PROCESS MODELS AND METHODOLOGIES

Sommerville (1995) has identified the following generic software development process models:

- The waterfall model - separate and distinct phases of specification and development
- Evolutionary development - specification and development are interleaved
- Formal transformation - a mathematical system model which is formally transformed to an implementation
- Reuse-based development - a system is assembled from existing components

Common methodologies include:

- Structured Systems Analysis & Design (SSADM) which is based on the waterfall model (Goodland and Slater, 1995).
- Mechanism for component reuse in Languages and Environments are: Borland Delphi; Microsoft Visual Basic; Microsoft Windows: CORBA and Java (Bennett et al., 1999).
- Rapid Applications Development (RAD) is a rapid linear sequential model based on component construction (Pressman, 1997).

- Unified Software Development Process for: visualizing, specifying, constructing and documenting object-oriented systems (Booch et al.,1998).

These methodologies/methods/software provide help in: analyzing a situation; defining the problem; designing the solution and in the subsequent implementation.

EXPERIENCE OF PROJECT SUPERVISION

A recurring experience in the supervision of software development projects in vocational education is the apparent lack of importance attached, by the students, to the use of a software development process model. Student projects should address a significant business or technical problem and it must be feasible to complete the project within the allocated time. Many possible realistic projects require some application domain experience which students lack. Thus many student projects are more implementation-oriented dealing with more general applications which are more easily understood. The major focus for the student therefore is the implementation issues. Students having the necessary practical skills can develop a tangible software product without compliance to any software development process model. Whereas adhering to a software development process model, which necessitates the use of abstractions, such as architectural design and process design, to ensure the achievement of certain software product quality attributes is much less tangible.

DEFINING SOFTWARE PRODUCT QUALITY ATTRIBUTES

Definitions of some software product quality attributes are given below:

Maintainability - it should be possible for the software to evolve to meet changing requirements

- Dependability - the software should not cause physical or economic damage in the event of failure
- Efficiency - the software should not make wasteful use of system resources
- Usability - the software should have an appropriate user interface and documentation

STUDENT PERCEPTION OF A PROCESS MODEL

A typical student's perception of a software development process model appears to be a series of milestones at which documentation is produced and presentations made to satisfy academic requirements. The documentation can take the form of:

- Initial Report - The student has to: demonstrate an understanding of the problem; to have completed sufficient preparatory work; to have a plan of work.
- Interim Report - This includes the analysis, requirements, initial design, prototypes etc.,
- Final Report - A documented system in terms of requirements, analysis, design, implementation, testing and systems manual and user guide.

The contents of the first two reports are frequently the only tangible visualization of the software product that can be seen and the correlation between these and the actual development work is really unknown.

The perception held by students may be attributed to a number of academic factors and industrial practices, which are listed below:

- academic assessment is based on the quality of the documentation;
- academic and industrial supervisors attach great significant to a fully functional product;
- graduates attached great importance to meeting deadlines;
- Small to Medium Enterprises (SMEs) place great significant in commissioning new software systems on time.

How each of these factors might lead to a lack of importance being attached to software development process models is given below:

academic assessment is based on the quality of the documentation

Whilst this statement is true, a common practice is the production of good quality documentation solely for the purposes of assessment **and not** as a design solution or a record of actual work done. In other words the documentation is not a natural byproduct of following a software development process model.

academic and industrial supervisors attach great significant to a fully functional product

It is a natural tendency to try and fulfil a software specification and satisfy the 'client' with the required working system. The drawback here is that 'slippage' in following a software process model may result in inherent defects in a delivered system. Practitioners may consider that additional functionality is advantageous to a 'client' and any defects can be corrected when a problem arises. Thus the software will be unavailable whilst the defects are removed. However with safety-critical software systems, such as air traffic control, the achievement of certain quality attributes such as reliability and response time is very important. However the achievement of some quality attributes may conflict with the achievement of other quality attributes e.g. the more functionality added to software the more difficult it may be to achieve or maintain a high level of reliability. A table provided by Vliet (1993) illustrates the trade-offs between quality factors.

graduates attached great importance to meeting deadlines

Informal feedback from graduates is that, the delivery of new systems is **the** priority and little emphasis is placed on documentation, if even produced. The rationale for this practice is that the life expectancy for systems is relatively short.

Small to Medium Enterprises (SMEs) place great significant in commissioning new software systems on time

It is a natural desire for all enterprises to have new software systems delivered on time. In the context of Hong Kong it has had a greater significance for SMEs who have always operated in a very competitive environment with very short time horizons. However if SMEs are to achieve more maturity in the process model they follow to develop software then they need to better manage their requirements and quality assurance. The requirements include setting the desired quality attributes at the commencement of each project.

The perception held by students of process models can have major consequences for industry. Graduates will develop software systems, which do not have the necessary quality attributes. The absence of the necessary quality attributes means a system does not fulfill the requirements. This may result in an organization committing additional time and resources to overcome the shortcomings of the delivered system. Systems might need to undergo considerable reworking to

achieve a state in which it is acceptable for use. In extreme cases the software may be scrapped altogether.

TEACHING AND LEARNING DOMAIN

Within the teaching and learning domain there is an established strategy in the conduct of software development project supervision. The learning objectives normally state that a student should apply their knowledge and skills to implement a solution of a reasonably complex problem set. The established strategy has strengths in terms of: monitoring progress, by regular meetings with the project supervisor : quality assurance, with students timetabled for project laboratory classes each week when teaching staff are available for general advice assistance. Quality assurance in this context is really to ensure that students are taking a disciplined approach to their work and utilizing a methodology in a proper manner. This is similar to a formal definition of quality assurance: Establish organizational procedures and standards for quality (Sommerville, 1995).

PROPOSAL

The proposed approach to address this situation is to establish a much more structured approach to project supervision to ensure a student performs quality planning and another person rather than the project supervisor perform the activity of quality control. (Any quality management activities should be separate from project management to ensure independence. Quality management in this context is the overall management of the quality of the software process and product.)

Formal definitions of quality planning and quality control as provided by Sommerville (1995) are given below:

- Quality planning

Select applicable procedures and standards for a particular project and modify these as required;

- Quality control

Ensure that procedures and standards are followed by the software development team.

QUALITY CONTROL

Teaching staff in the timetabled project laboratory classes each week can perform the activity of quality control. This is a clearly defined task of ensuring students follow a methodology using the appropriate techniques available. However the definition of quality planning given above needs more attention to actually determine what tasks need to be performed.

QUALITY PLANNING

At first glance one might consider the only task is to select an appropriate methodology suitable for the process you wish to follow in developing the software. An additional task that should be performed is that of selecting the desired software product quality attributes for that **particular** project. To define these quality attributes alone is insufficient. To help determine if the software product has these quality attributes requires some sort of measure to be able to be taken.

MEASURING SOFTWARE PRODUCT QUALITY ATTRIBUES

This task has been considered by Hughes & Cotterell (1999) who state 'Trying to find measures for a particular quality helps to clarify ideas about what that quality really is……In some cases we can measure the quality directly while in other cases the thing being measured is not the quality itself but an indicator of the degree to which the quality is present'. A student project proposal should include identified product quality attributes that must be present for their software to be considered acceptable.

EXAMPLES OF MEASURES

One example of a product quality attribute could be 'usability' and the first task is defining what this attribute means in the context of this project. This definition should be the result of negotiation between the student and the project supervisor. This definition could be …users should be able use the software after two hours training…or …the average response time is 30 seconds. This type of attribute can be quantified and measures taken to determine if the desired quality attribute has been achieved. Another possible product quality attribute could be 'maintainability', which includes incorporating new requirements. This is more difficult to quantify and measure. As mentioned by Hughes & Cotterell, above, sometimes it is not the quality measure but an indicator that it is present. How a project supervisor deals with 'maintability' is again subject to negotiation with the student. One could say you do not know how easy or difficult it is maintain software until a sufficient number of changes have been made over a period of time. Obviously this would be of no use in the context of a student project. However the project supervisor could take a number of innovative approaches such as: applying a design quality metric such as the *design structure quality index* ***(DSQI)***, Pressman (1997) provides a example of this metric; giving a new requirement after the software development has been completed. The ***DSQI*** measure can help determine whether further design work should be undertaken. A good measure would be indicative of a design with good characteristics that would enable relatively straightforward and efficient changes to be made to the software. Likewise the ease or otherwise of incorporating a new requirement after completion of the software will indicate the degree of maintability present in the software.

CONCLUSION

Many student projects are more implementation-oriented dealing with more general applications which are relatively easily understood when compared with more realistic projects. The major focus for students therefore is the implementation issues. A project student can create a tangible software product without any real compliance to any software development process model. However to have a chance of achieving the required product quality attributes, which more realistic projects would demand, necessitates sufficient attention being given to the software development process model. The required software product quality attributes identified at the commencement of the project must be achieved to be indicative that an acceptable software product has been developed.

Such an approach would ensure that sufficient attention is given to the software development process model to ensure that the desired quality attributes are achieved.

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DESIGN OF INTERNET-RELATED COURSES FOR IT PROFESSIONALS

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Key words: Internet, Course design, Programming, e-commerce, Multi-media technology, Security, Technical support

Abstract : With the emergence of E-commerce, the Internet-related activities have been escalated for the past two years in Hong Kong. As a result of this, there is an increasing demand on the IT professionals who are able to design, develop, and support the Web businesses. However, there are a few professional courses available in these areas to re-train the existing IT professionals. Although, e-commerce or related programmes are being offered by universities in Hong Kong, it needs to take a couple of years before the graduates are released to the market. There is an immediate need to design and offer related courses to meet the community need. This paper presents course design philosophy on the Internet-related certificate courses that are being offered jointly by the Division of Computer Studies and the School of Professional and Continuing Education, City University of Hong Kong. The paper covers the practicality on the course contents in order to meet the diversified skill sets. It addresses the balance between technical substances and commercial skills. These include the knowledge, skills and proficiency on e-commerce, programming, database design, IT security, legal issues, technical support, e-entertainment, web design involving multi-media technology etc. The strengths and weakness of these courses, students' behaviours, and the future direction are also discussed in this paper.

1 INTRODUCTION

The emerging e-business in recent years has opened up many opportunities for new development and training in IT applications. This emergence will translate into a new demand for the design of user-friendly, content based and sophisticated software over the Internet. On the other hand, the convergence of computing and communication technologies is beginning to impact on organizational processes in terms of product development, resource acquisition, order fulfillment, customer service and ways of doing business. Apart from the business to business and customer to business models, the product promotion, e-entertainment, security, multi-media based interface, and information search over the Internet are of significance to a successful business.

With the move to a knowledge-based society, there is a strong demand for IT professionals and business analysts to make use of the Internet platform for business activities. There is a strong demand of professional courses to train IT professionals to design, support and administer the web sites; business analysts to make use of the web site to promote products and to do business; security professionals to develop a more secure transaction platform making use of firewall; legal practitioners to enforce cyber law to protect both parties; and for Web designer to create a nice interface with creativity. In view of these requirements, this paper addresses the design issues related to the Internet based vocational courses. The objectives of this paper are to:

- examine how successful the courses have been in attracting and retaining learners and assess the methods used in the process;

- assess the success of flexible design methodologies in terms of the method of delivery and relevance of the training contents; and
- compare and contrast the performance of the various courses and identify factors influencing their performance.

The paper is organized as follows. Section 2 presents a brief description on course design related to the Internet. Sections 3 and 4 present the admission requirements and course structure. The learning environment, motive for attending and barriers are also discussed. Section 5 lists the operational consideration and objectives achievement. The course assurance and monitoring are covered in section 6. The advantages and limitations are discussed in section 7.

2 COURSE DESIGN

Shown in Figure 1 is the block diagram describing the Internet activities. In this diagram, a browser can access the information stored in a server or through its database server. The user might want to download software or to visualize the virtual reality effect. This involves the multi-media technology. A user might want to buy a product, he needs to input his Visa card number. This involves the customer to business model and security. A company buyer might place an order to buy products. This involves the business to business model. A business analyst might look at the opportunity of using web to promote products in order to have global presence and market penetration. A customer engineer might need to support the hardware, router, server etc. to ensure the system is running smoothly. A database administrator might support the web database to ensure the relevance of contents requested by the user.

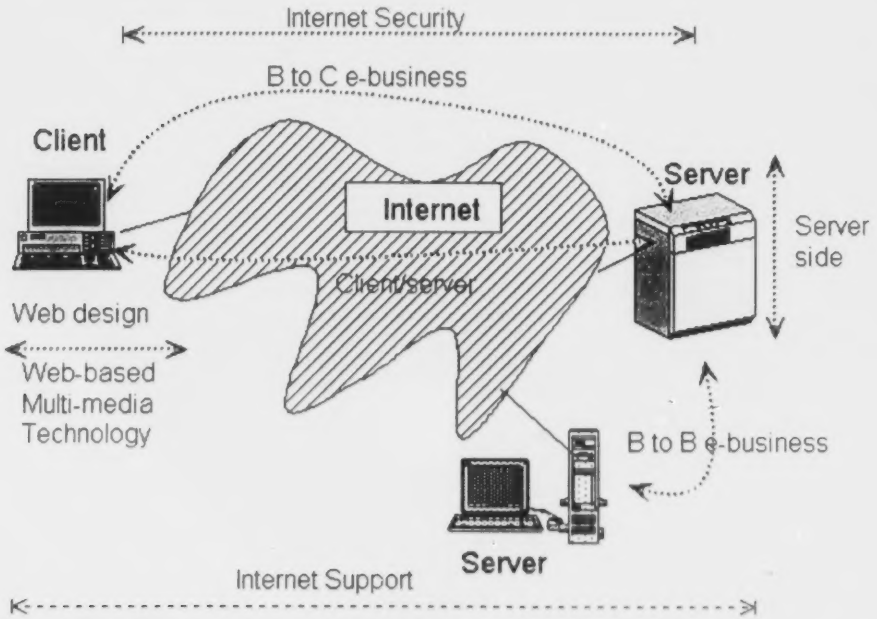

Figure 1 Training demands over the Internet

In order to meet the need, there are a number of potential courses that are specifically designed on the understanding the Internet as shown in Table 1.

Table 1 *Course aims and training platform*

Course	*Aims*	*Training platform*
Developing e-business	How to make use of the Internet to sell/buy products	Understanding the necessary technical skills, e-marketing, payment, security, legal aspects
Web Programming	How to develop client and server side to process data	Java, Database, JavaScript, HTML and Extended HTML
Web based Multi-media technology	To develop a sophisticated interface with graphics, animation etc.	Flash, director, virtual reality markup language, computer music, video/audio editing
Web design	To provide a good user interface and screen layout	Design foundation, sketch concept, 2D/3D visualization
Internet Security	To provide a secure trading platform and set up policy	Cryptograph, secure socket layer, virus free environment, firewall
Server side using Linux	To provide in-depth knowledge on the installation, commission, support of server using Linux	PHP, CGI, IP networking, X Windows, Linux
Internet Support	To provide support on Internet/Extranet	IP network, router, switch, LAN and WAN
Digital entertainment	To use Internet to provide game	Direct X, Script writing, Computer graphics, animation

The majority of courses are being offered. Some are even offered for longer two years. To describe the details of aims and objectives, two courses such as Web design and Server side using Linux are specifically shown below for reference.

2.1 Aims and objectives on Web Design

This course is designed to equip IT practitioners who has little knowledge on design but are involved in dealing with the use of multi-media products to develop Web applications. The working environment is the Internet based client-server system. This course aims to provide fundamental design concept, knowledge and skills to those who may wish to keep up with developments either for career advancement or the acceptance of new responsibilities. The course covers the materials to participants in developing more innovative but practical Web interfaces with the following knowledge and skills:

- Posses a sound broad-based foundation on visualisation;
- Posses the fundamental skills in 2D and 3D studies;
- Be capable to produce a 2D/3D layout/sketch using computer package; and

- Acquire an understanding in quick sketch, figure drawing, design principle, typography, colour principle, form and texture, and be capable to apply the techniques on the Web page.

2.2 Aims and objectives of Server Side using Linux

This course is about the server side, as Linux has become the powerful industrial standard operating system on computers ranging from PC to supercomputer. Linux is a UNIX like operating system, its kernel is supported in part by utilities provided by the Free Software Foundation. With the emergence of Internet and popularity of Linux as the WEB server, there is a strong demand for training IT professionals in the installation, system administration, networking, configuring and programming under Linux environment in the Internet. In view of this situation, this course is designed to provide an effective way for computer personnel with the breadth and depth of the knowledge and skills required supporting WEB server.

A reliable Web server relies on a number of factors including system performance evaluation, appropriate networking tool, Internetworking skills and ample support of CGI commands and PHP. This course therefore emphasizes the application of useful tools such as developing guest book, simple search engine, counter, dynamic HTML by making use of extensive freeware in the Internet. This will enable the administrator to provide a holistic service but secure server to the end user. In addition, this course covers the basic Unix commands and project for a new starter to learn from beginning and demonstrated their achievement through the project with the following knowledge and skills.

- Posses a sound and broad-based knowledge of Unix commands and internals;
- Understand the necessary system administration and installation;
- Be able to use shell programming to monitor the system performance;
- Be able to develop CGI programmes and Perl Programmes to interact with browser and database;
- Possess the abilities to develop X windows application;
- Posses the networking skills to configure the server as an Internet node; and
- Be able to develop useful Internet tools to help end users such as guest book, simple search engine, counter and dynamic HTML.

3 ADMISSION REQUIREMENTS

All the certificate courses are primarily targetted for those who were trained on conventional IT skills and for those who like to develop a career in web design, support, security, e-commerce and digital entertainment. These courses are also for those IT professionals who would like to build up their foundations on Internet related development. The admission requirements are:

1. should hold a Diploma, Higher Diploma or Degree in Design, Computer Science, Information Technology, Information System, Mathematics, Engineering, Business or equivalent;
2. are engaged in Web/Internet related jobs.

4 COURSE STRUCTURE AND STUDENTS' CONCERN

The aims of the course would have been achieved when all the objectives are met in the course. The objectives are reached through a curriculum and a variety of training, teaching methods and approaches used in the delivery of this course. To satisfy the objectives, the Internet related course provides:

- A programme of lectures to allow assimilation of the key components in the Internet computing environment.
- A range of modules to introduce the courses. For example, for Web design course, it covers visualisation techniques, 2D studies, 3D studies, and computer implementation to develop a skilled approach to problem solving and creative thinking through laboratory practices, tutorials and self-exploration.
- A staff supervised project in the last three months to apply the knowledge gained from the taught modules. The project must be a deliverable commercial product or business plan on the Web.

4.1 Learning environment

Many students don't like the conventional approach which packs all the materials together with breath not in depth. They liked this modular approach is that this approach allows 'the students to work at their own pace'. Students felt that this was a particular problem with University courses, which

- are generally time-constrained with too much to pick up in a short period of time; and
- require students to attend rigidly and it is very difficult to keep up if one misses lessons.

The modular nature of these courses allows students to take light exams, as many mature students had been outside an educational environment for a long time. Some expressed the view that asking the lecturer on the flexible training course was less embarrassing. Overall, it was evident that by splitting the areas into a number of courses seems to be a good way for them to gain experience of a learning environment. An advantage of a flexible course is that it should be easier to change course if it does not suit the individual.

Survey was specifically asked whether the approach might have a negative affect on motivation levels. The consensus view was that if an individual was prepared to attend a course then they had the required level of motivation. Of those that had dropped out of the course gave the reason that it was difficult to retain interest without a structure and also due to the workload in the daytime. However, some students felt that the modular nature of courses actually helped motivation. It is suggested that a more formal induction process may well counter some of the negative aspects that are inherent in a flexible learning environment.

4.2 Motive for attending

Whilst a high proportion of students did not know exactly what course they wanted to do they were for the most part clear that they wanted and/or needed to improve their Internet skills. A surveyed identified the reason for undertaking this course as being to get a job, and those who wished to improve their Internet skills related to employability.

Some learnt the Internet skills with the intention of going on to carry their computer job so that he/she would be able to become self-employed or work in a new job. Some took this as part of their continuing education. Only small minorities of students were attending simply to gain access to the Internet.

4.3 Barriers

All course materials are technical based and therefore it would be relatively difficult for IT layman with little knowledge on the use of IT to successfully complete the course. Indeed, except the e-business course that demands business, legal, security and limited technical skills, all the students felt that there is no specific problem on their learning. Another barrier that the students have to solve is to balance their workload and learning. Most of them are very busy with their daytime jobs and have little time to carry out their projects.

5 COURSE FLOW AND OBJECTIVES ACHIEVEMENT

All the courses are described key development components. Table 2 illustrates how these modules relate to the key development themes for the course of Web design. It also indicates where the stated objectives of the course are to be met. As stated in Section two of this paper, each course has its unique objectives achievement.

Table 2 Objective achievement for Web design course

Module of Study	*Drawing skills*	*Design skills*	*Computer skills*	*Management*
Visualisation Technique	?	?		
2D studies	?	?		
3D studies	?	?		
Technical implementation using PhotoShop		?	?	
Project	?	?	?	?

Here, this Web design course covers the objectives of drawing skills, design skills, computer skills and management as well.

Similarly, Table 3 illustrates how these modules relate to the course of Computer Game over the Web. Here, the objectives are different from Web design, as it covers technical, administrative, programming and management aspects in computer game.

Table 3 Objective achievement for computer game over the Web

Module of Study	*Technical skills*	*Administration*	*Programming skills*	*Management*
Game theory and Ethics				?
Game Project Management		?		?
Computer Graphics Theory	?			
Technical Overview of Game Development using Direct X	?		?	?
Computer Music and Sound Effect	?		?	
Script Writing	?	?		?
Game Development Engine	?		?	
Application of 3D Engine	?		?	?
Project	?	?	?	?

5.1 Mini-Project

A mini-project is mandatory in each course in order to provide students experience in managing, planning and controlling a system development project through the implementation of an application. It also provides an opportunity for integrating and practising the skills covered in the taught modules. Apart from technical implementation, this module covers:

- Design management
- Application of some of the skills, tools and techniques developed during the course to develop an action plan on the Web.
- Identification and definition of system development framework

5.2 Assessment

In order to obtain an award, each student is required to pass written examinations and submit a project of his own choice. The project must be related to the Internet such as computer animation, security action plan, business plan, e-shopping etc. The project must be completed three months after the completion of last module in this programme. To be eligible for the award of the certificate, students must:

1. achieve 70% attendance,
2. pass one written examinations (40%) set by the module lecturers, and
3. achieve a PASS grade (40%) for the project.

5.3 Teaching Schedule

A sample of teaching schedule which consists of four modules, one examination and one project related to Web design is shown in Table 4. Examination is in the format of multiple choice to reduce the students' loading. This arrangement makes them adaptable to the learning environment with less pressure arising from the examination.

Table 4 *Module flow for Web design course*

Sequence	*Module*
1	Visualisation techniques
2	2D studies
3	3D studies
4	Technical implementation using PhotoShop
5	Exam
6	Project

5.4 Summary of Teaching Mode

Each course is supported by what teaching pattern together with the facilities. Table 5 shows the facilities for the Web based multi-media courses. This enables the students to easily understand the flow of modules and their linkage amongst them.

Table 5 *Teaching mode for Web based on multi-media course*

Modules	*Lecture*	*Laboratory*	*Project*	*Training Platform*
Multimedia Project Management	6	6		MS Project
Multimedia Design, production and Management	9	9		Macromedia Director and Authorware
Internet Management	12	15		NotePad, Netscape, FrontPage 98, MS SQL
Human Computer Interaction	9	12		CorelDraw, Acrobat Reader
Internet Programming for Multimedia Application	12	12		Java, Java Script
Computer Music	9	9		16 bit sound card and MIDI interface
2D/3D Rendering and Animation	9	12		MacroMedia Flash
Virtual Reality	9	12		VRML
Project			24	
Sub-Total	75	77	24	Total=179

6 COURSE MANAGEMENT AND MONITORING

A course committee was established to conduct the course according to the regulations. In monitoring the operation and performance of the course the committee was responsible for such matters as admission, curriculum, teaching methods, assessments, evaluation and recruitment of course instructors.

6.1 Course Evaluation

Classes were conducted in three 2-hour sessions a week. As a result, the evaluation involved a qualitative and quantitative approach and focused on four areas which form the basis of the following:

- Effectiveness – to test whether the method adopted by the lecturer is appropriate
- Innovation – the teaching material can help create new ideas in their work
- Impact – how to make use of taught knowledge in their work
- Operational performance – the laboratory exercises are practice based.

Project progress was reviewed against the outcomes proposed in the original application and the project's success was also considered in the context of the aims of the programme.

6.2 Project

Students are paired up to do a project on their own choice. Most of the projects are related to their problems in their jobs. These might cover the security in a small or medium business environment, a multimedia based learning web site, a trading system, a web banner for promotion etc. Generally, there are relatively few on-going technical problems with hardware and these can for the most part be solved relatively simply with support from the supervisor. There were, however, delays in setting up the project because of the IT-based nature of the project.

6.3 Exam process

For the conventional exam paper involving questions, it is well known that it takes a long time for exam papers to be marked. In addition there are some administrative issues with some students being unable to take exams when they are out of town.

In addition students had been confused as to whether they themselves could undertake assessments. In this case, written exam in the format of multiple choice and group project between the students and the supervisor are employed. Multiple choice is used to test students' in breath understanding in all the taught modules, while a project of their own choice is to test students in depth knowledge on a particular area. They are generally required to develop a web site, work out a feasibility, study on security issues, e-business and network planning. They have to go through the process of project management, documentation, coding, verification and presentation. So far, there are over 200 projects that have been implemented by the students. These range from a pizza ordering system to learning courseware. Some projects involve heavily on the multi-media tools such as Flash, Director or VRML, while some involves programming such as JDBC, PHP etc. Some proposals are related to business ideas without the actual implementation such as a business plan to cover search engine and data mining.

Exam board ideally requires an objective, independent project in order to verify the value of individual projects. Students are happy with this arrangement, as there is no delay in the process of projects. For conventional course, some students have become disillusioned, as they have had to wait too long for results. Using this approach, students better understand the process themselves in order that they can explain the importance of an objective assessment process.

A few participated in the course, but did not take formal exams. Of the students who had left the course without taking an exam, the most common reason was that they were not interested in taking an exam, others had thought that the exam would be too difficult. A number of students have suggested that heavy work load have stopped them taking the exam

7 CONCLUSIONS

These certificate courses have proved to be very popular with mature students who may wish to keep up with developments either for career advancement or the acceptance of new responsibilities. These courses aim to provide fundamental design concept, knowledge and skills to students in developing more innovative but practical Web applications, security policy and business applications making use of the Web as a medium. The project has achieved targets in terms of the number of people attending the course and the vast majority of students are positive towards the project they chosen.

The project meets the broad aims of the courses to open up routes into employment for disadvantaged groups. The flexible nature of the project, and the in-depth implementation have been successful. Most notably the project has achieved a particularly high number of real

applications.

By providing the Internet related training, the project has been successful in improving the employability of students who have acquired the old computing skills but not the latest Internet related. A relatively high proportion of students had never designed and implemented the Web applications prior to this course.

At project supervision, students have an informal interview to discuss their training needs. This information is used to fine tune the subject contents. A more formal evaluation is conducted against individual lecturer's presentation skill, subject matters, logistics etc. Both surveys are of benefit particularly given the flexible nature of the project. Whilst this survey result could be reviewed on a regular basis, it would provide an element of structure which would cover milestones and qualifications aimed for.

Given the high skill levels of many students, the role of the lecturer and supervisor is key to the success of the courses. Whilst IT support is adequate for most students, there is a small minority who feel that the support available is not enough. A high proportion of those who cannot balance the heavy day time work drop out. Supervisors are always on hand to support students but at busy times they may be limited in the time they can spend with each individual.

Given the interest in training which the project has stimulated, students would benefit from vocational guidance on a more formal basis. These courses also provide students with routes into further training.

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A TQM STUDY OF FACULTY AND TRAINEES' PERCEPTIONS OF PUBLIC VOCATIONAL TRAINING INSTITUTIONS IN TAIWAN

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Index: TQM, public vocational training

Abstract: It is true that the public sector is organic so its degradation is inevitable. Therefore, the continuous review and improvement is the direction for public and private sectors around the world to go lest an organization be doomed to stagnate or wither away. The purpose of this article is to investigate the application of total quality management (TQM) on Taiwan's public professional training institutions; further to redefine a better management for them to keep the active vigor and growth. To avoid the discrepancy between theory and practices, many papers are widely collected concerning the institutional system, character, training category and TQM applications in the world; moreover, such areas as TQM definition and its actual performances and restrictions are the focuses of this article.

1. INTRODUCTION

General industrial experience with TQM practices in U.S. is chronicled from about 1980 with the broadcast of the NBC documentary "If Japan Can, Why Can't We?" which trust W. Edwards Deming and TQM movement to the forefront of North American manufacturing attention. Since then, TQM has spread all over the world. From the cases of the public sector in Canada, France, Germany and Holland, it is common for both private and public sectors to apply TQM with success. Similarly, TQM can be applied on Taiwan's public vocational training institutions without fail if the customary practices are considered and the organizational limits can be conquered.

There are 13 public vocational training institutions in Taiwan which are all affiliates of municipal, corporate body, and central government (Employment and Vocational Training Administration). In the narrow sense, public training is limited to the training implemented by public vocational training institutions. Regarding to Characteristics of Public Training as follows: (1) Institutional and operational expenditures are supported or borne by the government. (2) Job placement is one of the objectives of public training. (3) Training expenses are mainly borne by the government.

Due to resource limited, respond slowly and often lack incentives and recognition in the Public Vocational Training Center. Hence, this study will investigate the faculty and trainees' opinions on TQM and review the difficulties of public training institutions' practices on TQM, with a view to upgrading the training quality.

2. TQM (TOTAL QUALITY MANAGEMENT)

Massey(1992, 49-83) builds the theory of TQM by focusing on the need to redesign the research administration process. He identifies factors that reduce productivity in administrative and support areas along with recommendations for diagnosing problems and understanding the elements for an effective productivity improvement strategy. He raises four conditions that must be addressed for improvement effort: (1) resource constraints; (2) individual and group empowerment; (3) incentives, recognition, and rewards; and (4) strategic thinking. Massey proposes research administration processes at targets for development, his illustrations deal mainly with administrative processes that provides useful view for the management of public vocational institutions in Taiwan. He does not involve the faculty in terms of their perceptions; however, this study will verify the focus group inferences and clarify the faculty perceptions.

3. NATIONAL QUALITY AWARD CRIATERIA

Although there is not a single definition or blueprint for TQM, many examples such as the Baldrige Award criteria propose that leadership sets the environment for deployment through the system while relying on the empowerment of employees and fact-bases management practices. As the related theories shown herein, the National Quality Award Standard Structure covers the substantial content of TQM; moreover, it has been widely established around the world and applied on TQM. As a result, this study, on the basis of Taiwan's customary practices and organizational properties, takes Taiwan's National Quality Award as TQM criteria. Further, apply the indicators of Taiwan's National Quality Award to investigate customers' of public professional training institutions' opinions on TQM and review the difficulties of practices on TQM.

4. PERCEPTIONS ANALYSIS TO STAFF AND TRAINEES

In order to figure out what the opinions of the executives, administrators, trainers and trainees have about TQM's applications on training service quality. The article takes the employees and trainees from 13 public professional training institutions as its questionnaire subject; there are 1500 effective samples to be randomized and 916 feedback. According to the gleaned information, the statistical and inferring analysis is conducted so as to propose instrumental suggestions.

This study focuses on two aspects of importance and difficulty on the basis of variables. In terms of importance, nine indicators are combined to be six variables by factor analysis. They are information application and research development, human development and management, customer services quality assurance and social responsibility, high-rank management, TQM performance and organizational process. In terms of difficulty, nine indicators are combined to be six variables by factor analysis. They are customer services quality assurance and social responsibility, human development and management, high-rank management and organizational process, information applications and research development, TQM performance and quality assurance. For the analysis and discussion, such approaches are used as frequency distribution, descriptive statistics, t-test, one-way ANOVA (Scheffes' after-test will be the alternative for a comparison in case of any significant difference) and two-way ANOVA. (see Figure 1)

The analysis to the faculty and trainees is as follows:

(1) Regardless of personal background, the faculty or trainees all agreed with the importance in the training quality improvement by promoting TQM. (see Table 1)

(2) The faculty subject to such conditions as female, educational background equaling to master degree or higher, aged between 25 and 35 with work title of executives believe that there is no factor important than to upgrade the training quality by TQM. (see Table 2-4)

(3) Among the six factors, the following three draw more difficulty in case of execution:

A. High-rank management and organizational process: Among the faculty, non-executive trainers and administrators of bachelor's degree, aged 25-45 vote on this factor. (see Figure 2)

B. Human development and management: Among the faculty, aged 25-45, seniority of 6-15 years and being employed in municipal governments all vote on this factor. (see Table 5)

C. TQM performance: Among the faculty, those aged 25-45, affiliate of municipal all vote on this factor. (see Table 6)

(4) Among the faculty, executives of master or higher degree think that it is not difficult to upgrade the training quality by promoting TQM; however, among trainees, those with master degree are different from the faculty's opinion. (See Figure 3)

(5) According to the author's interview with the public sector affiliated to municipal governments, it indicates that it is harder to promote TQM by basic units due to the lack in talents and scientific quality control. Therefore, it should be the central authority that is responsible to build a practical system according to the demand of various training institutions, then prevail the system over them.

5. CONCLUSION AND SUGGESTION

Upon the Analysis from the above research, the study provides to set forth TQM suggestions for training institutions and they are hereby described as follows:

(1) Standards and objectives: This section is related to high-rank management and organizational process; it is fundamental but the hardest to carry out, while it will be helpful to promote TQM if public training institutions can set up standards and objectives. Therefore, it is suggested that TQM skills should be documentalized, formed and computerized; also, any inappropriate regulations or laws should be modified. Actually, any policy will never succeed without the support of leading officials. That executives all believe in TQM's essentialty is a beneficial pulse to get TQM promoted.

(2) Resources: Because the resources of training institutions affiliated to the municipal governments have are less than those of central authorities, employees of the latter are more optimistic about the promotion of TQM than those of the former. Thus, the municipal governments should acquire more resources to promote TQM

(3) Communication and execution among institutions: To have a policy performed effectively, it depends on the executive authorities and staff who have to make out TQM objectives, approval standards, performance technology and procedures through all communicating channels. Moreover, such key factors as high-rank management and organizational process, information application and research development, human development should be integrated and cooperated.

(4) Characteristics specific to executing institutions: The characteristics include the level, affiliation, size, organizational structure, staff composition and the external relationship of an institution will effect on the willingness and ability to promote TQM. Also, it should be highlighted on how to create an organization suitable for the TQM culture. Among the thirteen public training institutions, there are two corporate bodies that have stronger attitudes than governmental organizations and encounter less difficulty in performance. Such findings may prove private enterprises have more energy and flexibility, so the government should learn to form an organizational culture of active public services.

(5) Social, economical and political factors: Public training institutions should have a good awareness of the media. To let all citizens agree with the efforts made by training institutions and to win more support. Training institutions should keep constant touch, establish good interactive relationship, set up a complaint feedback system, hold regular surveys on the satisfaction with training program and employment of expertise so that they can identify the disadvantages or achievements of such institutions, revise their decisions and propose determined concerns.

(6) Executor's intention: As the research shown, all faculty and trainees of public training institutions think that it is no doubt to promote TQM and improve the training quality. However, it is a special requirement to instill the policy idea into those of bachelor's degree being employed in municipal government and non-executive trainers and administrators; further to provide opportunities to join in advanced and seminar programs, especially for female faculty. Also, the incentives should be regulated to help employees to get promotion and improve their ability because of advanced program. Additionally, the personnel management reforms should be emphasized. So, this thesis agrees with such reforms on faculty management, suggestions channel and intellectual restoration with a view to upgrade manpower quality and modify work approaches in conformity with the spirit of TQM.

In reality, it will cause great hindrance and confinement if TQM is fully applied to public training institutions; nevertheless, such disadvantages can be removed provided with a harmony between the spirit of TQM and the management of each individual public training institution. As the saying goes, "actions are mightier than words"; no policies are perfect except when they are fulfilled. As our government is devoted to making clerical reforms to build a government of honesty, efficiency and public servants, our national manpower resources will be well-developed; power be fortified, competence be risen supposed with effective TQM applications in line with the economy, society and politics.

6. FIGURES AND TABLES

The definition for D1-D6 and I1-I6 in Figure 1-3 and Table 1-4:
D1: Customer Services Quality Assurance and Social Responsibility D2: Human Development and Management
D3: High-rank Management and Organization Process D4: Information Applications and Research Development
D5: TQM Performance D6: Quality Assurance
I1: Information Application and Research Development I2: Human Development and Management
I3: Customer Services Quality Assurance and Social Responsibility I4: High-rank Management
I5: TQM performance I6: Organization Process

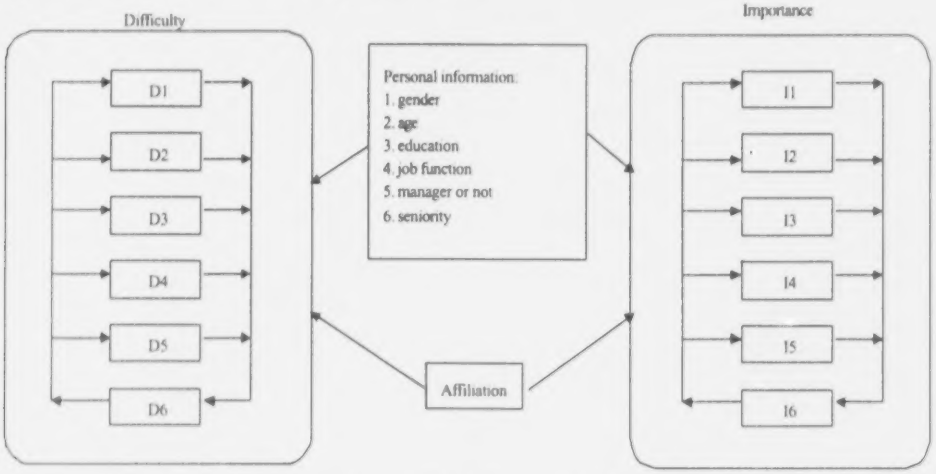

Figure 1 The conceptual framework of the study

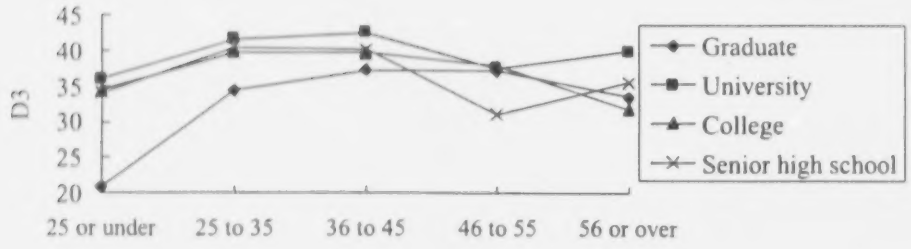

Figure 2 Analysis of difficulty for the age and education of faculty on high-rank management and organization process

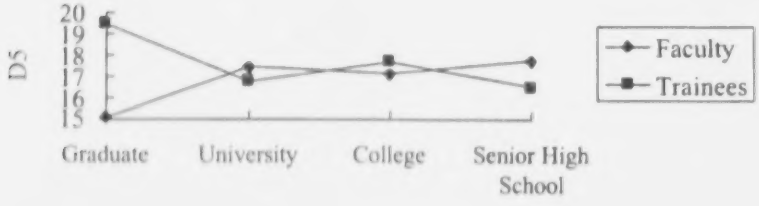

Figure 3 Analysis of difficulty for the education of the faculty and trainees on TQM performance

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Table 1 Analysis of importance for the faculty and trainees on TQM

Variables	Mean			SD			SE			Median
	Faculty	Trainee	Both	Faculty	Trainee	Both	Faculty	Trainee	Both	
I1	63.679	61.036	62.189	9.108	11.515	10.616	0.482	0.533	0.370	45
I2	54.200		54.200	8.576		8.576	0.449		0.449	45.5
I3	84.835	82.481	83.519	11.906	14.467	13.441	0.636	0.686	0.476	60
I4	26.095	24.498	25.204	3.178	4.278	3.910	0.161	0.193	0.132	18
I5	12.405	11.926	12.137	20.74	2.631	2.412	0.105	0.118	0.081	9
I6	29.953	28.794	29.296	4.109	5.455	4.948	0.209	0.243	0.166	21

Table 2 Analysis of importance for the gender of faculty and trainees on TQM (*P < 0.05)

Variables	Sample		Mean		SE		F (prob)		T value for unequality of variances (prob)	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
I1	599	205	61.83	63.35	10.60	10.75	0.044	(0.834)	-1.76	(0.078)
I2	261	100	53.64	55.81	8.66	8.09	0.156	(0.693)	-2.17	*(0.031)
I3	582	199	82.90	85.59	13.24	13.71	0.266	(0.606)	-2.45	*(0.015)
I4	647	213	25.18	25.32	3.84	4.06	0.274	(0.601)	-0.48	(0.631)
I5	657	217	12.09	12.34	2.45	2.30	0.842	(0.359)	-1.33	(0.184)
I6	650	218	29.10	29.90	5.00	4.82	0.920	(0.338)	-2.08	*(0.038)

Table 3 Analysis of importance for the education degree of faculty on TQM

Variables	Sample				Mean				SD				SE			
	G	U	C	H	G	U	C	H	G	U	C	H	G	U	C	H
I1	22	103	166	57	64.82	63.86	63.79	63.26	7.001	9.961	9.066	8.276	1.493	0.982	0.704	1.096
I2	22	107	162	64	54.45	54.89	54.05	54.14	8.337	8.618	8.604	8.395	1.777	0.833	0.676	1.049
I3	21	101	153	66	85.43	84.10	85.19	85.76	10.31	12.48	12.15	11.09	2.249	1.242	0.982	1.365
I4	24	116	173	67	26.50	26.18	26.07	25.84	3.007	3.220	3.274	3.033	0.614	0.299	0.249	0.371
I5	25	114	175	69	12.20	12.54	12.42	12.42	1.607	2.117	2.118	2.032	0.322	0.198	0.160	0.245
I6	25	111	173	67	29.72	30.17	29.86	30.10	3.373	3.917	4.392	3.806	0.675	0.372	0.334	0.465

(G: graduate, U: university, C: college, H: senior high school)

Table 4 Analysis of importance for the age of faculty on TQM (Y1: <25, Y2: 26-35, Y3: 36-45, Y4: 46-55, Y5: >56)

Variables	Sample					Mean					SD					SE				
	Y1	Y2	Y3	Y4	Y5	Y1	Y2	Y3	Y4	Y5	Y1	Y2	Y3	Y4	Y5	Y1	Y2	Y3	Y4	Y5
I1	14	86	166	69	16	63.50	65.13	63.23	63.72	60.88	8.582	9.143	9.548	7.787	9.722	2.294	0.986	0.741	0.938	2.431
I2	18	86	165	72	17	51.44	56.03	54.27	53.38	51.76	8.241	8.064	8.383	8.898	10.53	1.942	0.870	0.653	1.049	2.555
I3	17	82	158	73	16	83.59	87.27	84.23	84.27	83.13	9.709	11.73	12.31	11.26	14.31	2.355	1.295	0.980	1.318	3.578
I4	18	89	180	77	19	25.89	26.43	25.82	26.36	25.74	3.123	3.457	3.261	2.738	3.016	0.736	0.367	0.243	0.312	0.692
I5	19	91	182	76	18	11.95	12.80	12.34	12.37	11.94	2.013	2.056	2.074	2.071	2.461	0.462	0.216	0.154	0.238	0.580
I6	18	88	180	75	18	30.17	30.76	29.60	29.95	29.61	3.434	3.686	4.497	3.672	3.310	0.810	0.393	0.335	0.424	0.780

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Table 5 Analysis of difficulty for age, seniority, affiliates of faculty on human development and management (*P<0.05)

Factors		Sample	Mean	SD	SE	Scheffe'
Age	①25 or under	18	,32.2222	8.0114	1.8883	
	②26-35	82	,40.8659	11.6479	1.2863	② >①
	③36-45	165	,40.9455	10.5016	0.8175	③ >①
	④46-55	72	,35.6806	9.1341	1.0765	③ >④
	⑤56 or over	16	36.3750	11.1587	2.7897	
Seniority	①under 1	17	32.4706	8.0709	1.9575	
	②1-5	50	40.5000	11.5851	1.6384	③ >①
	③6-10	73	41.3425	10.5228	1.2316	④ >①
	④11-15	96	41.2188	10.8105	1.1033	
	⑤16 or over	97	36.6082	9.6583	0.9807	
Affiliate	①Central government	165	,37.7333	10.8274	0.8429	
	②Municipal government	153	,41.2288	10.9229	0.8831	② >①
	③Corporate body	39	37.1795	8.7475	1.4007	

Table 6 Analysis of difficulty for age and affiliation of faculty on TQM performance (*P<0.05)

Factors		Sample	Mean	SD	SE	Scheffe'
Age	①25 or under	18	15.2222	3.7816	8913	
	②26-35	87	18.1609	5.1487	0.5520	③ >④
	③36-45	174	,17.7701	4.5900	0.3480	② >④
	④46-55	74	,15.6892	4.5749	0.5318	
	⑤56 or over	17	15.3529	5.3026	1.2861	
Affiliation	①Central government	172	,16.5116	4.9329	0.3761	
	②Municipal government	158	,17.8228	4.8945	0.3894	② >①
	③Corporate body	45	17.6222	3.7434	0.5580	

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CURRICULUM DEVELOPMENT IN VOCATIONAL EDUCATION: ACHIEVING BALANCE AND COHERENCE

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Index: Curriculum Development, Balance, Coherence, Relationships, Change

Abstract: In the era of lifelong learning, with the potential of new information technologies to facilitate learning and assessment, the need for curriculum balance and coherence is as important as ever. Lessons from the past should be applied to future development. Over specification of curriculum requirements must be avoided, alternative viewpoints of coherence accommodated, and continuity in development sought. Curriculum components should be in balance, with appropriate emphasis on valued learning experiences. Emphasis should be given to developing key skills in breadth and depth, and to a balance of accountability and flexibility. A template of interrelated key descriptors is suggested.

INTRODUCTION

The context

The development of VET curricula and qualifications is needs to be flexible. Curriculum structures must be responsive to changing knowledge, skills and technologies, keeping up with the pace of industrial and occupational change, and to changing learning environments. Curriculum provision needs to accommodate the varying needs and intentions of learners to progress both to higher levels of education and to employment opportunities. The curriculum must provide a foundation for the future, develop individuals' confidence towards meeting unforseeable needs, and enable them to build their achievements into personal qualifications. No longer can an individual expect lifetime employment with a single employer. In our 21st century society people must grow to take responsibility for their own development, with expectations that employers will support them where this is applicable to their needs.

Concepts for characterising recent and future curriculum developments in Europe have been reviewed and developed (Kamarainen, 1999). In the USA the 'Tech Prep' programmes demonstrate the development of integrated curriculum standards and the contextualisation of learning (see for example Hull and Greville, 1998). In the UK emphasis on national control of qualification and curriculum content and quality has increased, and attempts are in progress to bring initial vocational and academic education closer together in one framework (Qualifications and Curriculum Authority, 1999) in response to the continuing calls for rationalisation and coherence of provision. But there is need to ensure local (college and school) providers can be responsive to the needs of the economy and of employers, and increasingly for individualised rather than institutionally based learning.

In the UK, and no doubt elsewhere, there are important lessons about curriculum development processes, to be learned from previous changes. This paper illustrates some of these lessons, drawn by the author from his involvement in vocational curriculum development and evaluation (in England and Wales), that should be applied when seeking to ensure balance and coherence in curriculum provision. The purpose is to stimulate thinking about their relevance and applicability

in curriculum change for life long learning with information technologies.

THE BUSINESS OF CURRICULUM DEVELOPMENT

Curriculum development generally follows a pattern of deliberate planning, which involves the stages of situation and needs analysis, design, implementation (delivery) and evaluation. These stages occur mainly consecutively with some concurrent activity. Most curriculum development is undertaken in response to identification of the need for action, to revise existing provision and sometimes to create quite new provision.

Successful curriculum development requires systems thinking, that is to say to consider at all times the whole of the system (and the interrelationships in the system) and not just the parts – to consider the effect of decisions made in one area upon another. This need is as paramount in the age of new information and learning technology and lifelong learning as before. A systems approach seems so obvious in principle and yet can be so difficult to practice. The often quoted curriculum theorist and psychologist Jerome Bruner (1966) said 'a curriculum is a thing in balance, which cannot be developed first for content, then for teaching method, then for some other particular feature'. How true this remains!

Successful curriculum development involves achieving balance and coherence:

- in the relationships between the components of learning – the aims and intended outcomes, the content - the knowledge and skills, the learning experiences, the assessment; and
- in the relationships with and between people, through accompanying staff and institutional development, attending to the staff and organisational implications of the proposed curriculum and qualifications, whether in the macro (national) context or involved in implementation (the local institutions and providers).

By balance is meant a state of harmony or equilibrium of the parts which make up the whole. By coherence is meant the logic and consistency in the relationships between components so that they are planned and fit for purpose. We need balance and coherence in the processes of changing the curriculum, in the design and in implementation.

There should be a balance, for example between:

the need for regulation of qualifications and the need for flexibility and responsiveness to demands;

serving national economic and industrial needs, and individual and personal needs;

general core knowledge and skills, and employer needed knowledge and skills;

immediate and longer term needs;

national/ central control and local control.

To achieve and maintain balance requires compromise between alternatives.

SELECTED LESSONS WHICH SHOULD BE APPLIED

- **IN CHANGING CURRICULA AND QUALIFICATIONS**

Four general lessons towards achieving balance and coherence:

Over specification of the curriculum must be avoided - the requirements which curriculum designers choose to specify, subsequently on implementation take precedence over matters which are not specified regardless of their relative importance. Clearly the curriculum specification - the aims, the outcomes, the content, the assessment requirements must be addressed by students and teachers. However a specification naturally constrains the behavior of teachers and learners, and to such an extent that other potential beneficial outcomes and behaviors are restricted and may not occur. It is important therefore to avoid over-specification and to control strategic matters but not to seek to control the detail. Care must be taken that what is measurable does not displace what may be equally important.

There will be alternative views about what is coherence. Coherence may mean different things from the viewpoints of the designer (coherence in theory), teacher (delivery coherence), learner (personal coherence) or employer (user coherence). It can be argued that personal and user coherence are particularly important. The advances in information technology give greater opportunity to demonstrate what is important and the curriculum framework must enable a flexible response. Combinations of knowledge whether academic or vocational, general or job specific must be possible and a common template can help to assure parity. Students have differing interests, motivations, employment needs and not least prior knowledge and experience. A coherent curriculum will enable them to make choices accordingly, with guidance and support.

Continuity in development is necessary, making changes in the light of continuing evaluation of past provision, but not based only on the most recent evaluation. Developers and managers with new responsibilities are keen to learn from the lessons of the immediate precursors, but so often do not allocate the time or resources to look back at earlier provision and evaluations. In making changes which may be needed, don't destroy the good and successful aspects of the old in creating the new, but build on and enhance the past.

Reasons for resistance to change must be respected and understood, but innovation is doing new things to achieve new purposes and successful curriculum innovation will involve a mixture of strategies. Change requires concomitant resource use and should take the longer view.

- **IN CURRICULUM DESIGN**

It is necessary to have a balance, an equilibrium, between the key components of the curriculum - the objectives (intended outcomes, competencies); the knowledge and skills content – key concepts, key skills; the learning experiences – key activities; the assessment strategies and methods, giving due accent on learning experiences and modes, and the crucial nature of work related experience.

In developments in the UK, for example, over a period of time different innovations have emphasised different components to the relative exclusion of others, resulting in curricula out of balance and need for further change.

The specification controls intentionally the shape of the curriculum, but so often designers' decisions introduce constraints unintentionally, without appreciating the effects they will have on learning. For example emphasis on detailed objectives/outcomes and assessment criteria (as introduced by the Technician Education Council in the 1970's, and again in the development by NCVQ of General National Vocational Qualifications, GNVQs, in the 1990's) led to an imbalance with respect to learning experiences and unanticipated effects on the use of time by teachers and by students. If we demand too precise or too extensive objectives, or if the assessment system is too tightly defined, then the constraints may prevent creative teaching and learning. As Eisner (2000) states 'as objectives and standards become more precise they proliferate and swamp teachers' capacity to deal with them.' Similarly if content is specified in detail, accompanied by a tightly controlled external assessment regime with a view to achieving externally controlled standards, a consequence may be inflexibility and responsiveness to students interests and motivations, and to employers needs. So the appropriate course of action is to consider the implications and interrelationships of the key curriculum features required and set up processes which control the quality of operation (e.g. to ensure that learning is not being attempted for which resources are not adequate).

Overcome the reluctance to state learning experiences and activities. While a list of mandatory learning experiences and activities could become as stifling as over explicit objectives and assessment, failure to specify learning activities which are known to be beneficial means opportunities missed to shape the direction of learning. At this time of rapid expansion of electronic communication it is vital that there is sufficient flexibility for learners to use these newer leaning environments, and to critically appraise their use. Contextualised learning must be emphasised with attention to active modes of learning. As Lave (1991) says, 'knowing' is never context free and learning is a 'social collective phenomenon' rather than an 'individual psychological one'. Work experience and work based is crucial. A curriculum statement must be a stimulating statement, which enables methods to be chosen to meet the need of individuals.

Avoid over prescription and over specification, of any one component at the expense of others. Alternative practices should be evaluated to determine the optimum style of specification.

For example, so often in curriculum development, at least in the UK, have assessment issues and control dominated concerns. Recognise that assessment is usually a sampling process in which methods must be related to the kinds of outcomes.

- **IN CURRICULUM IMPLEMENTATION**

In curriculum design the focus is on defining the learning which should take place. On implementation the curriculum becomes the medium through which teachers and learners interact.

Key skills must be developed in appropriate breadth, and extended in depth (to a higher level), rather than those already achieved rehearsed. It should be the learners' concern and must be the teacher's role to ensure each overcomes their individual knowledge and skills deficiencies, and that their skills are extended and new skills developed rather than time spent on rehearsing existing

skills without progression. A great deal of emphasis has been placed on designing skill deficiency tests and processes of monitoring skill development through logbooks and profiles. It is the teacher's job to educate (lead) the student forward to achieve new skills. It has been my experience that students who have mastered certain skills at a particular level, may be given further practice at that level rather than their development extended to a higher level or time spent on developing other skills in which the student is deficient. The challenge is to combine breadth and depth for the individual and recognise the breadth of skills required. While emphasis is being placed in the UK (and elsewhere) on the skills of 'application of number', 'communication' and 'information technology', which now form a new Key Skills Qualification, and on the skills of 'working with others', 'learning to learn' and 'problem solving', there are others, notably for example, working independently and flexibly, being entrepreneurial and self motivated, handling financial affairs. Emphasis must be on developing individuals' capability to plan their own learning. Problem solving requires being able to apply knowledge and conceptual understanding in undertaking tasks in particular areas.

An appropriate balance must be managed between the accountability required for quality and the flexibility which engenders creativity. Many regulations and constraints may ensure quality within a given framework, but at the expense of flexibility and creativity. This is true for the work of both teachers and learners. Coherence may be achieved through quality systems which monitor among other things: programme delivery, learner support structures, activities and assignments which integrate key skills, team work by teachers and students, communication between teachers and students, good leadership in touch with the learners, and evaluation of the impact of the curriculum upon them.

Avoid assessment overload, recognising that assessment of learning is a sampling process. Distinguish clearly between the role of assessment in the process of checking and reinforcing learning and assessment to measure achievement or competence. In a national qualification system balance local, internal assessment, and external assessment. The use of information technology gives opportunities for the management of assessment giving flexibility of time of testing, objectivity, for updating, and for feedback. Information technology enables the development of interactive questions and virtual problem solving. Nevertheless, a balance is needed with assessment methods which involve the judgements by qualified teachers of assignment work, portfolios, projects and other evidence following their interaction with students, and subject to independent moderation processes.

Do not underestimate the time needed for learning and achievement. Aptitudes of individuals must be catered for. Younger learners, those returning to learning, and learners in new territories, need an external structure in which learning is managed and supported. They need initially at least, help with managing their learning and towards becoming more autonomous. Most learners need to interact with others as part of the process of learning.

IN CONCLUSION

In the light of the above, a template for the specification of a curriculum with a unitised structure, might comprise

(a) the key descriptors at national (or sub-national) level which embrace the wide range and, in

principle totality, of all possible curricula and qualifications, which enable kinds of learning and achievement at specified levels to be combined, and provides pathways for progression;

.(b) the key descriptors for the curriculum for the individual learner, or group of learners with similar needs.

(a) Descriptors of the National (or sub –national) framework might be:

Programme Area
- Title and Level
- Purpose and Aims
- Structure - Combinations of Units, core and optional Units, rules of combinations
- Key skills - integrated and contextualised
- Work experience/work related requirements
- Assessment strategies

Units of Achievement (National or sub-national or local)
- Title and Level
- Pre-requisite knowledge, skills and experience
- Learning Outcomes (with assessment criteria)
- Content: Knowledge and Skills
- Content: Learning Experiences
- Assessment methods
- Indicative resource- based, individual, and group learning opportunities

(b) Descriptors of the curriculum for the individual learner might be:

Criteria for choice of programme and Units:
- Relevance to future work and/or educational progression opportunities
- Relevance to personal interests, motivations and needs
- Aims: short and long term
- Key skills - levels and breadth

Chosen Programme and Units:
- Aims, learning outcomes and content
- Timetable
- Learning arrangements: work based - work experience
  learning centre based / teacher led / independent
  group work with other learners
  interaction with learning materials and resources
- Assessment arrangements: as required by Units

Continuing evaluation of progress

Identification and review of personal pathway and progression

Some unforseen and unanticipated learning experiences may arise within individuals' programmes from their working and social contexts and interactions. A balanced and coherent curriculum will accommodate the consequential and important beneficial outcomes.

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Discussions with colleagues of the Further Education Development Agency and of other bodies during previous development and evaluation projects are gladly acknowledged.

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PROVIDING COMPETECY-BASED EDUCATION FOR INDUSTRY AND ITS EFEECT ON CLASSROOM EDUCATION

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Index: Pro-trainer one; competency-based education; vocational training

Abstract: This paper is set upon the scenario of a synergy from two leading technical education institutions in their joining exercise of providing an industry-oriented curriculum for a university level degree course. A course model of *Pro-Trainer One* is devised to foster this initiative at the first evaluation year in which the result was demanded to be effective. The strategy of developing material toward this exercise is demonstrated and the evaluation of this synergy is also examined. The newly established Taishan Training University was meant to become a model in which prospective collaboration among many institutions can follow.

INTRODUCTION

This paper aims to evaluate how to establish mentoring strategies for higher education system, particularly those technical and scientific curriculum based universities to provide their teaching expertise directly to industry. In the year of 1998, a synergy was formed by merging from two leading institutions, National Taipei University of Technology (NTUT) and Taishan Vocational Training Centre, to found the Taishan Training University (TTU) in Taiwan, the first of its kind in this country. The goal of this program is primarily to be in line with the government's policy in developing domestic high-tech and advanced cooperation from education and training expertise, and also raising the best technical manpower both in theory and skill. This joint strength in both academic and industrial institution will provide degree courses for prospective trainers and develop techniques that are interchangeably leveraged from academic system and real world practise. The strength and weakness of this model are examined and some spin-offs received by participants in this course are also addressed. Due to the fact that a correlated nature of technical education and industrial curriculum developing system, many advantages from this collaboration also give birth to many developmental tools that can be utilised by these two institutions.

Upon the completion of training cycles, the professional trainer would be able organise, execute and evaluate professional industrial training programmes and elevate the level of professional ethics and encourage an attitude of respect for one's work so as to become an instructor or a person who can carry out teaching in training institutions or particular field of industry.

Current Professional Education at the University level in Taiwan

As far as Electrical Engineering (EE) is concerned, the distinction between general-purpose universities who offer degree courses in EE and the technical universities is that the technical universities have more number of departments dedicated to the same wider theme of professional education, such as in EE. In other words, EE department in technical universities is often split into more than one departments, from Electrical Engineering, Electronic Engineering, and even Computer Engineering, to name a few. The EE degree is a general course that covers disciplines in Electricity, Electric Machinery, Communication, Computer, Control, Semiconductor, Electronics, Electric-Optics, etc., An example of Electrical Engineering Department run by NTUT shows that it tends to cover Electricity and Control, while Electronic Engineering Department tends to include Electronics, Computer, Communication, etc. This will often result in the situation that the students in Electronic Engineering have less experience and poorer picture of wider applications of Electrical Engineering. Same thing also happens to Electrical Engineering students who also lack knowledge in Computer and Communication. This presents a major problem in the modern technology the integration from many technologies is highly pursued and each discipline is correlated. As a result, students are confronted with the challenge when they are in the midst of re-inventing their career by exploring other related professions.

The EE program in the Taishan Vocational Training Center aims to integrate these two curriculums and offer a higher level of competency in the physical jobs environment. Based upon the current resource in NTUT, this program not only inherits the benefits from each Electrical Engineering and Electronic Engineering can offer, but also creates courses opportunity of their integration in which students can opt for modules from both categories. The program also shortens the length of study from three years to two years, but the time of actual course hours is remaining the same in total.

A Degree Ready for Industry

"Meet up with Real World Practice" is another vision targeted by both NTUT and Taishan Vocational Training Center, although NTUT is much more involving with laying down a firm foundation in theory. On the other hands, Taishan Vocation Training Center admits students who must have a two-year college degree and most students admitted reveal that they can enter the industry directly and smoothly after this comprehensive degree program, while the students in NTUT might consider to enter a higher level of research in post-graduate study. This offers two different perspectives that the synergy from the two institutions must take into account thoroughly. Therefore, this program has a higher percentage of lab works and on jobs training and this forces students to be imposed to the real world.

A Degree and also a Certification in Industry

To develop an effective training model for the unique program, the *Pro-Trainer One* curriculum has a special emphasis on the acquisition of certification that is highly favored by industry and trainees. A survey of the trainees in this program on the shows that more than 50 percent of students wish to acquire professional certification which is offered as a feature in this program.

The program can end up with university degree in EE and/or *Pro-Trainer One* degree. However, it has been a policy administered by Education Ministry that 72 credits hours are compulsory while for students also within *Pro-Trainer One* degree have to pass 1800 hours of on-jobs exercise which is also specified firmly by the country's Labor Ministry for anyone wishing to obtain a certification in teaching as a trainer and therefore this makes a total hour of 2500 within one year. This results in a very intensive course arrangement in this trial scheme. Students almost have to study from Monday to Sunday, in which Monday to Friday morning, courses are conducted at Taishan Vocational Training Center and Friday afternoon to Sunday at NTUT.

EVALUATION

Evaluation and observation of this program at Taishan Vocational Training Centre will be shown it to be a very useful and systematic method in developing material.

Feedback from the students:

A questionnaire is designed to understand how effective the program can deliver to the student. Among the valid 112 samples, the following fact is revealed (Lo and Hwang, 2000):

1. The level of satisfaction of the overall program: Over 60 percent of students has a satisfactory feedback;
2. Over 60 percent of the students feel that the course hour is too intensive the loads on the student is very heavy;
3. Over 90 percent of the students acknowledge the program can be organized in two year of length.
4. Theorem-based courses should be instructed by NTUT while lab-based course to run by Taishan Vocational Training Center to reduce the overlap and thus the load for the students.

The Synergy of provision Pro-Trainer Degree

At Taishan Vocational Training Centre, with its Human Resources Training and Development team, this initiative is continually provided the opportunity of growth and update as the relationship established based on reasonable subsidiary scheme. For example,

(1). The purchase of software: This scheme allows the unit to purchase software in the light of teaching and compatibility between software usage at two sides

(2). A grand opportunity of mastering professional drawing systems, such as AutoCAD.

(3). Due to the founding nature of this scheme and the high allowance of budget available form government, this unit has been introduced to some of the state-of-the-art training facilities.

(4). Classroom styles and techniques are taught at Taishan Vocational Training Centre. Instructors received better skills of presentation skills.

(5). On of the greatest benefits in working at Taishan Vocational Training Centre is given the opportunity of access and see the first-handed types of electrical and electronic engineering technology that is prevalent nowadays.

These are only few of the advantages working with Taishan Vocational Training Centre. The tests of our abilities and providing knowledge and dependability have also been a challenge. This is rewarding and worthwhile experience for all the staff and experts out from NUTU who devoted themselves in this initiative.

DEVELOPING PRO-TRAINER ONE CURRICULUM FOR THE FEEDBACK

Taishan Training University (TTU) and National Taipei University of Technology (NTUT) are going to set up with the strategy to develop a training model for the prospective education system in this country. This involves with the study to devise course materials that must be highly effective. *Pro-Trainer One* thus comprises the following steps (Analoui, 1993):

1. Constructing a Task Analysis;
2. Performing a Behaviour Analysis;
3. Writing up Criterion Tests;

4. Selecting Instructional Strategies
5. Developing instructional materials
6. Validating instructional materials.

When the above tasks are comprehensively studied, a trainer should be capable to demonstrate their proficiency in producing sound and well-organised programs that will meet the specific needs of selected groups in electrical engineering facility. The following is a brief account of how each of these items works and an explanation of further usage in Pro-*Trainer One*.

Constructing a Task Analysis

A task analysis is an instructional tool exploited by developers or trainers, which would assist them identify which major task that a trainee must carry out and what subtask that will help trainee accomplish within one parental task. This coherent approach will offer an insightful analysis to each specification and a clear picture of what the trainee is expected to accomplish in succeeding any given course, (Dryden, 1999; Birnbraver, 1985)

The most effective method that can also be employed in commencing a task analysis is by means of querying: *What do I want the trainee to do or perform after getting through the training program or one unit of instruction?* The program courses units must be broken down to tasks and subtasks following by the analysis of target population (trainees) who will be going through the materials that are being developed. One can start by identifying those most relevant and stop at the point where one wants the learning to begin (Milano, 1998; Arwady, 1987).

Performing a Behaviour Analysis

Behaviour analysis is one of the more sophisticated tools that are applied in the Pro-Trainer One developing process. Principally, it is to measure or determine the proficiency of a person's skills associated to a performance specified by the task analysis (Somekh & Davis, 1997; Esseff, 1986). It is therefore, in reality, that behaviour analysis acts as a bridge between the task analysis and criterion test items. The behaviour analysis poses the question: *What behaviour is required to fulfil the task?* The major types of behaviour that can be analysed: *Cognitive*, *Psychomotor,* and *Effective*. Cognitive behaviours are the intellectual or mental skills, which fall into the hierarchy of behaviour in this category (Rae, 1997). They consist of:

(1).Recall;(2).Recognition;(3).Multiple-discrimination;(4).Concepts/principles:(5).Problem solving.

Effective behaviours are commonly referred to as *Emotions*, *Values*, *Attitudes*, and *Feelings*. However, effective behaviours can have an effect on the cognitive and psychomotor behaviours (Esseff, 1986).

Effective behaviours may comprise, but are not limited to:

(1). Leadership; (2). Responsibility; (3). Initiative; (4). Resourcefulness; (5). Bearing and behaviour (body language)

In Pro-Trainer One, it is essential that each of the behaviours of trainees be assessed, especially in jobs, which deal with interpersonal contact with customers, clients, etc. The behaviour analysis is then integrated into the task analysis to determine the most appropriate means to effectively test learners (Esseff, 1986).

Writing up Criterion Tests

The term criterion test is often normally regarded as criterion-referenced test item. The word

referenced is used to clarify its meaning. The word criterion means standard. In the criterion test items, the standard is the performance set by the task analysis.

A criterion test item is referenced to one specific task, which is readily identifiable. Hence, when a trainee looks at a test, which is made up of this sort of question, he or she should be able to determine precisely which task is measured by each test item. The value of the criterion test items stem form two points:

(1). The item refers to, or mirrors, one predetermined task.

(2). It measures the directed learning, which has taken place.

The criterion-test item can be best described by the following guidelines: Teach (a) only what will be tested, and (b) everything that will be on the test; and test (a) only what has been taught, and (b) everything that has been taught.

Selecting Instructional Strategies

This topic plays a critical part for learners' retention, and deals with instructional strategies. Instructional strategies refer to a mixed-use of modes, media, and environment selected to carry out instruction. Instructional strategies are used to present the information identified in the task analysis, collect the response from the learner, and provide feedback to the learner. In deciding the appropriate instructional strategies, there are three questions the instructors/developers must query themselves: (a) in what modes that an effective instruction can be ensured, (b) with what media can yield an effective instruction, and (c) in what environment that an effective instruction can be obtained. Instructional modes are described as methods for presenting information, collecting responses, and providing feedback (Henerson, Morris, & Fitz-Gibbon, 1987; Feldman, 1985).

Instructional media are those resources that are used to present information (stimulus), collect responses, and provide feedback. They also act as a reinforcement to supplement other methods of delivery. Certain media are more appropriate than others for presenting tasks. For example, generally, tasks ad subtasks fall into three main categories: (a) People-to-People tasks; (b) People-to-Paper tasks; and (c) People-to-Machine tasks

Each media has its own advantages and disadvantages and this needs considerable investigation to find out the best media. Statistics today shoe that a combination of all of these media is required in order to maximise learners' retention (Ashton, 1999; Feldman, 1985)

There are four major environments where learning may take place:

(1). Classroom environment: (2). Independent study: (3). Skills labs: (4). On the job: In Pro-Trainer One, the course takes place in classroom, skills labs and also on-the-job and the independent study is left to the trainee to accomplish.

Developing Instructional Materials

Instructing methods are highly associated with learning environment, and the selection of media. Current statistics shows that a mix of media and environments can optimise retention for the learner (Feldman, 1985). When considering instructional materials for Pro-Trainer One, two primary concerns are addressed: (a) *How can materials currently available be used or adapted to allow learners (trainees) to carry out tasks designated in the task analysis*, and (b) *how can new materials be developed from the task analysis?*

There are a number of criteria should be aware of when developing instructional materials:

(1). The materials must meet the needs of the targeting population;

(2). The materials must make use of the design documents developed;

(3). The materials must be interactive;

(4). The materials must state objectives at the beginning of each module.

In other words, if the materials are enough to meet the requirement, there is no need to develop more. In summary each design document and its practical application in document or evaluation is as follows:

(1). Tasks identified in the task analysis will provide the content for programmes and instructional materials;

(2). The behaviour analysis will be utilised to determine what types of knowledge and performance tests requited for development;

(3). The sequence of the tasks will be mapping to the learning hierarchies and courses outlines;

(4). The programmes will be modularised and broken down to a number of units in order to make them more accessible under various conditions of time frame limitation and participants interests.

Validating Instructional Materials

The closing step in the development process for Pro-Trainer One is the validation process. It is probably the most important steps since it is the real assessment to ensure that the initial criteria is gained. It is essential to make the courses a success.

In applying Pro-Trainer One, it is to bear in mind that the targets of validation are the materials rather than the trainees. The material might not be fully suitable but it needs people's feedback and revision until the targeting population of learners achieving a score of 90% or higher of instructional objectives set at the beginning. The main criterion here is to ensure that those items tested ate actually covered in the material provided. Often some items of interest deemed necessary and tested are not really covered in the material. Therefore, validation and re-validation may be necessary. One more item to stress in the industrially designed curriculum is to prioritise the arrangement of information by the task analysis and to make sure in the development process that appropriate coverage of the material is provided.

CONCLUSION

The professional methods of planning, developing, and delivering the material has equipped the team at National Taipei University of Technology highly professional within a pretty short span of time. The benefits to NTUT are explicit and the teams have experienced a good teaching atmosphere with more up-to-date software and hardware. The feedback to the academic system and technical education here at NTUT is overwhelming and the opportunity of working in a cross faculties and disciplines also brings to this initiative an enormous benefit and improvement in teaching and research. In the technical education ground, students are more confronted with challenge in job markets where the competition is fierce. However, the road to developing industrial favoured curriculum still has many challenges to overcome. Working with such a multifaceted project, multitalented group of individuals has presented another issue in the realisation of synergy. Though all the phases of delivering a better result, this initiative has always preserved and some other benefits are yet to be realised from establishing the partnership between two leading industrial institutions in Taiwan.

A large number of faculty staff will have the opportunity to take classes, instruct lectures, and develop materials. Though much of this achievement will be reviewed and this type of refresher in

theses processes is of benefit to anyone who was involved. The overall gains in the program for NTUT is virtually not predictable but will be realised through affiliation.

It is the long-term commitments for NTUT for the industry but some of the tasks are beyond normal administration scope and process and that means the gains is still debatable. Though all of the difficulties to date have been overcome. This also had seen a considerable stress on the staff working under this collaboration initiative with the partner institution. Long hours and a lack of qualified or interested personal who would be willing to involve has also put a strain on those of staff working with Taishan Vocational Training Centre. The amount of workload with usually short turnaround time has placed a challenge for team at NTUT, if flexibility had not been factored, could have been avoided.

Overall, this synergy has enabled those staff that worked at Taishan Vocational Training Centre to gain higher capability through delivering the successful result. This also strengthened the academic institution capability in practising vocational education and established a firm link between the education professionals both in academic and in the industry.

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COMPETENCY BASED TRAINING: AN EVALUATION OF A POST-SECONDARY TEACHER EDUCATION PROGRAM

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Index: Competency Based Teacher Education

Abstract: The purpose of this study was to evaluate performance-based teacher education (PBTE) in Arkansas, United States. PBTE is an approach to teacher education in which a person is required to demonstrate essential teaching skills in an actual teaching situation. It is a competency based education program for individuals who plan to be instructors at postsecondary technical institutes. The sample was 74 technical instructors at 11 postsecondary institutes in Arkansas. The competency categories rated highest by the instructors were instructional planning, instructional evaluation, serving learners with special/exceptional needs, and teaching adults.

INTRODUCTION

Performance based teacher education (PBTE) is a system which introduces teaching skills in an educational environment and requires teachers to demonstrate knowledge of these skills in a classroom or lab setting. "Actual performance of the tasks insures that the teacher has not only the knowledge required, but also the ability to perform the competencies (teaching skills or tasks) that are essential to successful teaching" (Hamilton & Quinn, 1981, p. 7). PBTE is a training program that is individualized, focuses on outcomes and allows flexible pathways for accomplishing the outcomes. It makes clear what is to be achieved and the standards by which the achievements are to be measured (Kerka, 1998). PBTE requires more planning and organization than traditional education as well as an extensive process of identifying relevant skills needed in a teaching position, organizes those skills so that learning activities can be developed, requires hands on materials, delivers instruction with nontraditional methods, and requires extensive record keeping (Foyster, 1990).

PBTE in Arkansas Technical Institutes

The approach to PBTE in Arkansas technical institutes focuses on competency based education for individuals who plan to be instructors as well as those who are already instructors. The materials used for this program are a series of modules developed by the Center for Vocational Education located at the Ohio State University. The design of the materials was funded and sponsored by the U.S. Office of Education and the National Institute of Education.

This research-based program uses 132 separate learning packages, called modules, which focus on 400 professional competencies found to be important to occupational specialty instructors. They are designed for use by those responsible for professional development and teacher training. Each module was extensively field tested in staff development and teacher education programs at

18 institutions of higher education. The evaluations and field tests resulted in self-directed learning experiences that integrate theory and application. After completing the self-directed experiences, the instructors demonstrate the application of the theoretical information in an actual classroom setting (Fardig, Norton & Hamilton, 1977; Hamilton & Quinn, 1981).

In 1982 the Arkansas Department of Education, Vocational Technical Education Division, began a professional development program for all instructors hired into the state's postsecondary technical school system. The purpose of the program was to provide professional development opportunities for the instructors teaching in technical areas. The PBTE program developed by the National Center for Research in Vocational Education addressed these teaching skills (Andrew, 1987). All instructors in the state system were either occupational specialists hired directly from industry to teach technical courses in areas of trades, literacy, business, health, and academic skills or trained as content area secondary teachers. Their students were training to enter industry jobs.

A university vocational teacher educator coordinated the Arkansas PBTE program. The primary responsibility of this teacher educator was to observe instructors demonstration of knowledge, skills and attitudes required to perform a given teaching competency. The teaching competency areas identified within the PBTE program were as follows:

Category A: program planning, development and evaluation

Category B: instructional planning

Category C: instructional execution

Category D: instructional evaluation

Category E: instructional management

Category F: guidance

Category G: school-community relations

Category H: student vocational organizations

Category I: professional role and development

Category J: coordination of cooperative education

Category K: implementing competency based education

Category L: serving learners with special/exceptional needs

Category M: assisting students in improving their basic skills

Category N: teaching adults

PURPOSE OF THE STUDY

The purpose of this study was to evaluate the usefulness of instructional materials used in the Performance Based Teacher Education (PBTE) program used in Arkansas. These materials were the 132 modules developed by the Center for Vocational Education.

METHOD

Sample

The participants in this study were all technical instructors at all 11 postsecondary technical institutes in Arkansas who were actively involved in the PBTE program. The instructors included in this study were: (a) Trade -- those teaching welding, electronics, mechanics, automotive service,

drafting, air conditioning and refrigeration, industrial maintenance, tool and dye technology, industrial processing and diesel technology; (b) Literacy -- those teaching adult basic education; (c) Business -- those teaching computer information systems, accounting, computer applications, business education, and office technology; (d) Health -- those teaching nursing, medical assisting, surgical technology, and applied health; and (e) Academic -- those teaching math and communications. Instructors who had not participated in the program within the past two years were not surveyed.

Instrumentation

The survey instrument included a complete list of 132 PBTE modules, which included one or more teaching competencies. Using the official records of the University resource person, an individualized survey form was developed for each participant. The modules completed by each instructor were highlighted in yellow on the survey form. Participation in the survey was voluntary and responses were kept confidential. Each instructor was asked to respond only to those modules they had completed. They responded on a five-point Likert type scale ranging from "very helpful", "helpful", "somewhat helpful", "slightly helpful" to "not helpful". Data were analyzed by giving the "very helpful" category a rating of 5 and decreasing to the value of 1 for the rating of "not helpful". In addition, a short demographic section was included which asked for area of instruction, number of years as an instructor, years in the occupation and level of formal education. The instrument was not tested for reliability or validity since it was a complete listing of all teaching modules, which made up the total PBTE program.

FINDINGS

One hundred thirty seven (137) surveys were distributed to technical instructors at 11 technical institutes. Seventy-four (54%) were returned. Twenty-nine of the respondents were trade instructors, 19 were literacy instructors, 6 were business instructors, 5 were health instructors and 11 were academic instructors. Four respondents did not indicate their teaching area. Their years of experience as an instructor ranged from 1 to 23 years, with the average being 6.4 years. The years of occupational experience ranged from 0 to 50 with the average at 11.5 years. None of the respondents has less than a high school diploma. Nineteen had a high school diploma, 11 had an associate degree, 24 had a bachelor's degree, and 16 had a master's degree. One indicated other, and 3 did not indicate a level of formal education.

The mean response for the total group of participants was the highest, at 4.1, for the instructional planning competencies (Category B). This was followed by three categories of competencies with a mean of 4.0. These were: instructional evaluation (Category D); serving learners with special/exceptional needs (Category L); and teaching adults (Category N). The mean score for the total group was 3.8 for all 14-competency categories.

The trade instructors rated the instructional planning competencies (Category B) the highest with a mean of 4.4. The second highest rating for trade instructors was for the instructional evaluation competencies (Category D) with a mean of 4.2. This was followed by the instructional execution competencies (Category C) and the serving learners with special/exceptional needs (Category L) both with a mean of 4.1. The mean responses by the trade instructors for all 14-competency categories were 3.8.

The literacy instructors rated the teaching adults competencies (Category N) the highest with a mean of 4.0. The next highest rated by literacy instructors were the coordination of cooperative education competencies (Category J) with a mean of 3.8. This was followed by the serving learners

with special/exceptional needs competencies (Category L) and the assisting students with improving their basic skill competencies (Category M) both with a mean of 3.7. The mean response by the literacy instructors for the total 14 competency categories was 3.3.

The business instructors rated the serving learners with special/exceptional needs competencies (Category L) the highest with a mean of 4.3. This was followed by the implementing competency-based education competencies (Category K) with a mean of 4.2. Next were the instructional evaluation competencies (Category D), assisting students in improving their basic skills (Category M) and the teaching adults competencies (Category N) all with a mean of 3.7. The business instructors rated all 14 competencies categories at 3.6.

The health instructors rated the instructional evaluation competencies (Category D) the highest with a mean of 4.9. Next highest for health instructors were the instructional planning competencies (Category B) with a mean of 4.7. This was followed by the coordination of cooperative education competencies (Category J) with a mean of 4.6. Next were the instructional execution competencies (Category C) with a mean of 4.5. The mean response for the health instructor for all 14-competency categories was 4.5.

The academic instructors rated two competency categories the highest with a mean of 4.4. Those were school-community relations (Category G) and serving learners with special/exceptional needs (Category L). The second highest were the teaching adults competencies (Category N) with a mean of 4.3. This was followed by the instructional planning competencies (Category B) and the guidance competencies (Category G) both with a mean of 4.2. The academic instructors had a mean score of 4.0 for all 14 areas of competency categories.

The results of the analysis of variance performed on the years of teaching experience revealed the following: Academic instructors with 1 to 10 years of teaching experience had a significant higher perception of the program planning, development, and evaluation competencies (Category A) than those with more than 10 years of teaching experience ($p = .0014$). Health instructors with 11 or more years of teaching experience had a significant higher perception of the program planning, development, and evaluation competencies (Category A) than those with less teaching experience ($p = .0000$). Business instructors with more than 15 years of teaching experience had a significant higher perception of the program planning, development, and evaluation competencies (Category A) than those with 1 to 15 years of teaching experience ($p = .000$). There was no significant difference in years of teaching experience and all other categories of modules.

The results of the analysis of variance performed on the years of occupational work experience reveled that trade instructors with 1 to 30 years of occupational work had a significant higher perception of the program planning, development, and evaluation competencies (Category A) than those with over 30 years of work experience ($p = .0210$). There was no significant difference in occupational work experience and all other categories of modules.

The level of education did reveal significance difference between groups. The instructors with an associate degree had a significant higher perception of the program planning, development, and evaluation competencies (Category A) than those with any other level of education ($p = .0424$). There was no significant difference in level of education and all other categories of modules.

The analysis of variance did reveal a significance difference in teaching area ($p< .05$). The health instructors had a significantly higher perception of the usefulness of competencies in seven of the categories (A, B, C, D, E, J, K). The academic instructors had a significantly higher perception of the competencies in three of the categories (G, I, L) than all other participants. The remaining categories (F, H, M, N) revealed no significant differences by teaching areas.

DISCUSSION

There were 4 competency categories, which were consistently rated the highest, at the helpful level. The serving learners with special/exceptional needs competencies (Category L) were rated the highest. Specific competencies in this category consisted of identifying and diagnosing exceptional learners, planning instruction, providing appropriate instructional materials for exceptional learners, modifying learning environment for exceptional learners, using instructional techniques to meet needs of exceptional learners and assessing the progress of exceptional learners. It is quite possible that participants viewed themselves as being prepared to teach traditional students; however, they felt inadequate to teach special/exceptional students. Therefore, they viewed these competencies as being helpful.

A second category consistently rated high was the instructional planning competencies (Category B). Competencies in this area included determining needs and interest of student, developing performance objectives, developing a unit of instruction, developing a lesson plan and selecting instructional materials. It is possible that these groups of competencies were viewed as helpful since they are basic instructional skills, which are needed on a daily basis by instructors.

The next category frequently rated high was the instructional evaluation competencies (Category D). Competencies included were establishing student performance criteria, assessing student performance, determining student grades and evaluation instructional effectiveness. These competencies may have been regarded as helpful since instructors were concerned about grading students in a fair and impartial manner. These competencies help with establishing and conducting student evaluation.

The last category that was rated consistently high was the teaching adults competencies (Category N). This area includes competencies such as determining adult training needs, planning instruction for adults, managing the adult instructional process, and evaluating the performance of adults. These competencies may have been rated high since many instructors felt they needed help with the overall instruction of adults due to their experiences with teaching in pedagogical rather than the andragogical areas.

There were some differences of perceptions of the program planning, development, and evaluation competencies (Category A) regarding teaching experience, years of occupational work experience and level of education. Since the instructors are moving from industry or other levels of education to postsecondary teaching, they may be more responsive to those competencies related to planning an overall program of instruction.

Health instructors had a significantly higher perception of modules related to the instructional process and clinical instruction on the job site than other instructors. None of the health instructors in this study had formal training in teacher education. It can be assumed that this is why they had a higher perception of modules than the other instructors.

Academic instructors had a higher perception of the modules on school/community relations, professional role and development and serving learners with special/exceptional needs than other instructors. The change from a public school setting to a postsecondary setting with adult and community involvement may have attributed to their perceptions in this area.

CONCLUSIONS

Of the 14 competency categories in the Arkansas PBTE program, the instructors found that the areas that contributed the most to their teaching development were instructional planning,

instructional evaluation, serving learners with special/exceptional needs and teaching adults. All of these categories were perceived as being helpful.

The results of this study show that instructors found that all the modules were a helpful form of training. This indicates that a competency-based program such as PBTE was accepted by instructors. PBTE offers a self-paced, individualized way to improve the teaching skills of instructors.

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PERCEPTIONS OF PARTICIPANTS IN A MULTI-SITE DISTANCE LEARNING BACHELOR OF SCIENCE DEGREE PROGRAM

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Index: Distance education, multi-site distance learning, distance education bachelor's degree

Abstract: The purpose of this study was to determine student's perceptions of distance education courses taken during a Bachelor of Science degree program designed for adult off-campus students. The following factors were examined:

1. Student learning – self-rated levels of learning and understanding of content.
2. Instructional techniques – instructor's use of lecture, handouts and visuals; instructor's ability to encourage students to participate and reflect.
3. Medium – how the technology affects the pace of the class, the quality of transmission and how different sites interact.
4. Attitude – self-rated feeling about preferences for distance education instruction.
5. Possible uses of distance education – students' view of future uses of distance education.

INTRODUCTION

"Distance education can best be described as the separation of student and instructor during the process of education delivery" (Swift, Wilson, & Wayland, 1997, p. 1). Distance education allows students to be in different geographic locations and receive instruction from the teacher at the same time.

Steiner (1999) identified the defining elements of distance education as "the separation of teacher and learner during at least a majority of each instructional process and the use of educational media to unite teacher and learner and carry course content" (p. 1).

Many distance education programs are designed to meet the needs of the non-traditional adult learner. The proportion of college students who are adult learners has been increasing steadily, with projections of over 50% by the millennium. Fewer than one in six undergraduates fit the traditional stereotype of the American college student – 18-22 years of age, attending college full-time, and living on campus (Griffiths & Gatien, 1999). The majority of distance education students are working adults seeking advanced degrees. Approximately 85% of the adult learners work.

PURPOSE

The purpose of this study was to determine student's perceptions of distance education courses taken during a Bachelor of Science degree program designed for adult off-campus students.

The following factors were examined: Student learning – self-rated levels of learning and understanding of course content; Instructional techniques – instructor's use of lecture, handouts and visuals, instructor's ability to encourage students to participate and reflect; Medium – how the technology affects the pace of the class, the quality of transmission and how different sites interact; Attitude – self-rated feeling about preferences for distance education instruction; and Possible uses of distance education – students' view of future uses of distance education

PROCEDURES

Twenty-seven students who completed eight distance education classes hosted by a major university were selected to participate in this study. The technology provided a voice-activated two-way video/audio transmission. Each site was equipped with a local and a remote monitor. Seven sites were used, and they were all located within the state.

The class size ranged from one student to eight. Questionnaires were mailed to each student who participated in the program. The researcher did not know or have knowledge of any student name, only their assigned number.

Participants. Participants for this study were students enrolled in a bachelor's program for vocational education. Five professors were the primary instructors in the program. Topics of courses covered were: Advanced Strategies in Technical Education, Analysis of Teaching in Technical Education, Curriculum Selection and Selection of Use in Technical Education, Surveying Special Student Populations in Technical Education, Use of Student Resources in Technical Education, Advanced Management in Technical Education Programs, Current Trends and Issues in Technical Education, and Tech Prep in Technical Education. Of the 27 students enrolled in the program, all participated in the study. A total of 27 usable questionnaires were returned for a response rate of 100%. Of the 27 students enrolled, 7 were female and 20 were male. Ages ranged from 25 to over 55 with the majority in the 45-54 age group.

All participants were working full time in technical positions at vocational technical colleges. They taught in such areas as automotive technology, computer technology, culinary arts, diesel technology, electronics technology, machine technology, and nursing.

This program was part of a three-year project funded by the State Department of Higher Education. Participants were required to complete the necessary coursework to obtain a bachelor of science in vocational education. Most students received reimbursement for tuition from the state department of higher education.

INSTRUMENT

A 42-item questionnaire, adapted from Treagust, Waldrip, and Horley (1993), was used to measure attitudes and perceptions of distance education undergraduate students. Permission to use the questionnaire was obtained from David Treagust (personal communication, November 13, 1995). Students were asked to rate their perceptions of student learning, instructional techniques, medium, attitudes, and possible uses of distance education using a five-point Likert scale.

DATA ANALYSIS

The data was analyzed using the SPSS for Windows statistical software package. Mean score and frequency calculations were compiled for the following five factors: student learning,

instructional techniques, medium, attitude, and possible use. Variables of interest were: age, gender, size of class, and number of distance education classes completed.

RESEARCH FINDINGS

On a five-point Likert scale, possible uses of distance education was rated the highest followed by medium, attitudes, instructional techniques, and student learning.

Gender. When examining factors by gender, females rated all five factors higher than males. Of the five factors, student learning had the greatest difference between mean scores by males and females, followed by instructional techniques and distance education medium. The least differences were attitudes and possible uses of distance education.

Age. The students ranged from 25 years of age to over 55 years with the majority of students in the 45 – 54 age group. The student over 55 years of age had a slightly more positive attitude than other students.

Size of class. At the seven remote sites, class sizes ranged from 1 to 9 students. Minimal differences are observed in the mean score for the factors.

Number of distance education classes completed. The more classes completed, the more positive the attitudes of the students were. However, no differences were found in the area of instructional techniques.

The statement "Distance education provides opportunities to do courses that may not be normally available" received the highest rating on the questionnaire with a mean of 4.7. The statement with the lowest mean score (3.3) was "Distance education has had no effect on my learning in the classes."

DISCUSSION

Overall, the perception in all five factors (student learning, instructional techniques, medium, possible uses of distance education and attitude) was positive with possible uses of distance education having the highest mean score. Participants felt positive about distance education after having been involved in the program. Students continued to take additional courses in the program.

Distance education programs are an effective means of communication to offer courses at geographic locations that would not otherwise be possible without the long travel time of instructors and students. Offering courses at a distance provides an opportunity for students in rural areas to take courses from an institution of higher education. It is not surprising that these students would have a positive attitude toward distance education.

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A STUDY OF RELATION BETWEEN ASSESSMENT DIMENSION AND MANAGEMENT OUTCOMES — A SAMPLE OF SINYI REAL-ESTATE COMPANY

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Index: Assessment Dimension; grey relational analysis; Management Outcomes.

Abstract: This study explored the relational grade of Assessment Dimension and Management Outcomes with Grey System Analysis. The candidates were promoted to be a chief of chain store over half years after they had finished the process of assessment center. The results show P&O and A&J dimensions were the most relation with management outcomes. And the quality index is the advance sub-factor of analysis. The different initial value normalization may influent the result of grey relation was discovered in this study. It's valuable to use mean value, max-value, min-value and interval value for normalization in the future study.

INTRODUCTION

The concept of Assessment Center was initiated during World War II (1948). The military of German, England and American developed a tool by the concept of Assessment Center for selecting spies who will work oversea. In 1956, AT&T first used the tool to select supervisors. The validity was very good (Chuang, 1991). Then, Assessment Center was applied in many fields and focused on selecting and training. It also has many studies of validity. The researches of assessment center almost concentrate in the predictive validity of overall assessment rating (Hwang, 1998). There are few researches to study the relation between assessment dimension and the performance of participant.

Lately, Chinese scholar Chi-long Den announced the Grey System Theory in 1982. The theory gave much help in social science research. The research method of Grey System Theory provides the scientific data to clarify abstract system. The ideas of grey relation grade analysis can whiten the grey relation amount every grey system (Den, 1996).

The development and performance of Assessment Center's participant were under the influence of many factors. It is not easy to avoid the criterion contamination (Wu, 1992). Those phenomena are the trait of social system. The relation information between both systems is not clear or exact. It is difficult to describe the relations concretely. We always verify with inference logically or apply the concept of conscious and rule of judgement to conjecture. The process is complicate and much limit. It is waste time and inconvenience for studying. But, the grey system theory provides the chance to clarify relational validity.

THE ORIGIN OF MANAGEMENT ASSESSMENT CENTER

Social organization and effective management are the great achievement of mankind (Kast & Rosenzweig, 1970). The organizational prosperity and decline depend on managers' ability. Long-term performance of enterprise always based on the managers' competence. Progressive technology and science let technical and capital intensive trade face more risk at decision making. Manager's leading behavior and decision-making is the key to business's profit and loss. Unsuitable middle managers make business loss average US$ 250,000 dollars per year from some papers (Chuan, 1991). Therefore, selecting suitable manager is an important thing

in the organization.

The speed of organization change is accelerating during modern era. Managers are in the center of the organization's change. They have the responsibility to adhere the change of organization and implement organization's change. Their management competencies affect the development ability of organization deeply. Hence, all of organizations discover the importance of manager development. And it takes much effort on the management development.

A Chinese idiom:" Careful beginning of an activity is better than anything". Let manager practice on the job for learning by doing will take much risk than select a potential and suitable candidate at the beginnings. Over half century, the theory of human selecting was leading by prediction paradigm (Woodruffe, 1993). The methods of selecting have some ideas by experience, and provide some explanation to people's behavior and competency. To predict the future performance of candidates is necessary. Then, assessment center was applied.

BRIEFING OF ASSESSMENT CENTER

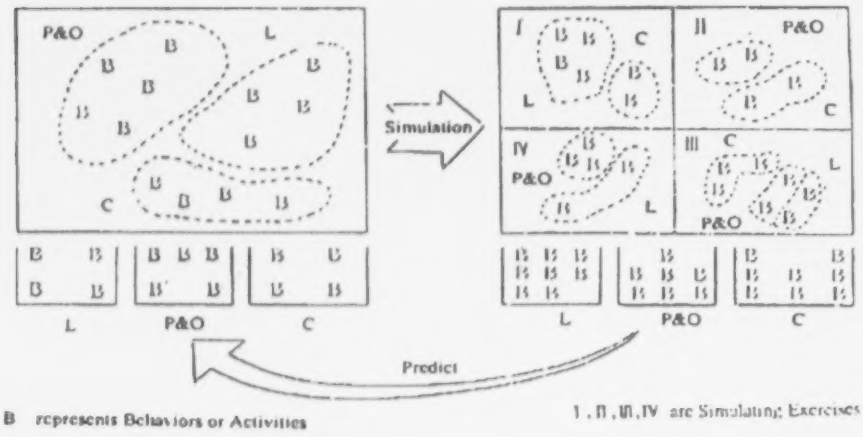
Assessment center concept was initiated during World War II (1948). The military of German, England and American developed a tool for selecting the spy who will work at oversea. 1956, AT&T firstly uses the tool to select supervisors. And the validity was very good. The assessment center method was used in a variety of organizations rapid growth. There are over 5000 assessment centers in USA lately. In addition, Canada, Japan, British, German, Mexico, Holland, and Australia also adopt assessment center method as the tools of evaluating &cultivating manpower. In Taiwan, China Steel Company uses assessment center method to select third level manager firstly. Sinyi Real-estate Company developing the Assessment Center method for selecting chief of chain-store, and had implemented 15 times chief selecting by Assessment Center.

Assessment Center is an evaluated method of standardization. It must analysis the Objective Job for obtaining the needs of abilities and attitudes on the job. Then design or select the exercises or tests for find out the abilities from candidates. During the process, candidates participate in simulation and interview under controlling situation. The assessors must have the experience on Objective Job and participate assessor training. They observe, interview and record the behaviors of candidates. Then integrate and analysis the record data and prepare the assessing reports for reference in promotion, training and settlement (Chuan, 1991; Wu, 1992; Wea, 1995; Lin, 1996; Huang, 1998; Moses & Byham, 1980; Thorntoon & byham, 1982; Woodruffe, 1990; Lau, 1996).

The left Figure 1 is categorized into dimensions with job-related behaviors obtained from a job analysis. The right figure is categorized into dimensions with behaviors. Those perform on the simulation by participants. These dimensions provide a more detailed assessment that is appropriate for judging whether a person is likely to be an effective manager or not. It suppose one has good performance in the simulation situation, will have good performance in the real work (Chuan, 1991).

Every organization or company's situations are different and their applies of Assessment Center are different. But assessment center's basic components are same. There are: A. Participant; B. Assessor; C. Role Player; D. Administrator; E. Simulation Exercise; F. Assessment Dimension.

Fig.1 The Basic Principle of Assessment Center



IMPLEMENTATION OF ASSESSMENT CENTER IN SINYI COMPANY

Sinyi Real Estate is a chain-store re-house company. Every store spread at every corner of big cities in Taiwan. The chief of store likes a general role at outside area. They manage the members and operate the store. Also, they are the first line manager to contact with customer. Company must delegates the most authority and requires them take responsibility. Therefore, the chief's management ability affects the performance of store and the bottom line of company. The role of chief is very important in the company (Lin, 1996). Sinyi Company set up a Management Assessment and Development Center project (MADC). We process a series work for preparing the MADC. According the function of Assessment Center proof, the current job of candidate and the target job are more different, the validity of assessing is higher than before (Huang, 1998). Then we select the store chief as the Objective Job for MADC.

ASSESSMENT DIMENSION & MANAGEMENT OUTCOMES

Assessment dimensions are different according to the different job and grade. Each assessment center's assessing items of dimension depends on the requirement of Target job. In Sinyi Real-estate Company, to survey the content of management of store chief from the chiefs, managers and subordinates, pick out more important and frequent management items. Then discuss with execute management team and experts to define the assessing dimension as follow: 1. Planning & Organizing (P&O). 2. Analyzing & Judging (A&J). 3.Leadership (L). 4. Decision (D). 5. Managing Control (MC). 6. Communication (C).

According to the results of discussing in the executive management meeting, there are 10 items represent the management outcomes of store chief in the Sinyi Real-estate Company. These can be referred to evaluating. 1. Achievement of the quantity of re-house entrusted (AQE). 2. Achievement of the quantity of dealing house (AQD). 3. Achievement of the quantity of revenue (AQR). 4. Achievement of the quantity of real income

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(AQI). 5. Qualities index (QI). 6. Employee's turnover rates (ETR). 7. The rates of Achievement of the quantity of re-house entrusted (RAQE). 8. The rates of Achievement of the quantity of dealing house (RAQD). 9. The rates of Achievement of the quantity of revenue (RAQR). 10. The rates of Achievement of the quantity of real income (RAQI).

GREY RELATIONAL GRADE AND ADVANCE ANALYSIS

There are many systems influence each other in the real world. And these influences are not easy to clarify. The relation among system, system and sub-system are complicate. Scientists try to solve the relation among systems with every knowledge and mathematics method. Although it is difficult to do, many researches and statistic methods were developed. A Chinese scholar Professor Den had developed grey system theory. The theory can whiten the abstract system. Grey relational grade is one of methods for finding out the relations. (Hong & Lee, 1996, Kur, 1997, Ma, 1997, Cheng & Tsi, 1997)

Grey relational grade analysis measures the relation between factor's trends of development. (Den, 1996) This method is different with other method of factor analysis. The feature of Grey relational analysis as follows: (Hong & Lee, 1996)

A. Statistic analysis requires mass data and canonical spread rule, Grey relational analysis doesn't. It doesn't need so serious.

B. It's simple to calculate, even compare with multiple factors. It isn't so complicate like statistic analysis.

C. Grey system method is comparing the trend shape of geometrical curve. The trend shape are more similar, the relation grade are closer. It doesn't appear strange situation that positive relation be recognized negative relation.

Advance Analysis is used on comparing multivariate series. Mother series (mother factor) is a Reference series, sub-series (Sub-factors) are Compare series. Reference series and Compare series makes relation matrix. Through relation matrix analysis, we can find out, which series is advance factor.and others are not. (Den, 1996, Hong & Lee, 1996)

RESULTS AND DISCUSSION

There are fifteen participants who were promoted after they take part in the assessment center. This study isn't including the persons who have not promoted. We use five scales to represent the dimension's level during assessing process. One have the excellent capability in the dimension, we scored with 5; good capability, scored with 4; average capability, scored with 3, below average, scored 2, little capability, scores 1. The new chief's performance data were collected at first half year. The performance data include 10 items of management outcome as follow: AQE, AQD, AQR, AQI, QI, ETR, RAQE, RAQD, RAQR, RAQI.

Assessing dimensions are treated as reference series; management outcomes are treated as compare series. After calculating the relational grades, the grey relational matrix is showed as follow list.

Relational Matrix List							
	P&O	A&J	L	D	MC	C	Total
AQE	**0.8286**	0.6391	0.6695	0.7160	0.7103	0.6993	4.2627
AQD	**0.7773**	0.6709	0.6637	0.7198	0.6839	0.7129	4.2284
AQR	**0.7056**	0.6066	0.6203	0.6699	0.6488	0.6616	3.9129
AQI	**0.6637**	0.5569	0.5579	0.6179	0.6082	0.5876	3.5922
QI	0.7409	**0.9045**	0.8494	0.8602	0.8687	0.8855	5.1093
ETR	0.6975	0.7155	0.7402	**0.7597**	0.6888	0.6979	4.2996
RAQE	0.7179	**0.8718**	0.8274	0.8491	0.8320	0.8489	4.9470
RAQD	0.6645	**0.8730**	0.8272	0.7809	0.7925	0.8058	4.7440
RAQR	0.7290	**0.8934**	0.7995	0.8328	0.8183	0.8397	4.9127
RAQI	0.7230	**0.8850**	0.8145	0.8373	0.8287	0.8321	4.9206
Total	7.2480	7.6168	7.3696	7.6436	7.4801	7.5713	

Analyzing & Judging had the most relational grade with **quality index** (0.9045), and had the least relational grade with AQI (0.5569). **Planning & Organizing** had higher relational grade with **AQE, AQD, AQR and AQI** than others. **Analyzing & Judging** had higher relational grade with **RAQE, RAQD, RAQR and RAQI** than others. **ETR** had the most relational grade with **Decision**, and had the least with management control. AQI had the least grey relational grade with every management outcomes. In the reference series, higher total relational grades are **Decision and A&J.** In the compare series, the highest relational grade is **quality index**.

CONCLUSION AND SUGGESTION

Social system is always complicate and doesn't easy to find out the relation between each factors. Professor Den proposed grey theory for whitening vague social system. From this study, we can identify the relative grade between assessment dimension and management outcomes. Advance analysis clarifies the detail relation amount series.

Management outcomes can be divided three categories. First cluster contain AQE, AQD, AQR, AQI, those focus on quantity of achievement. Second cluster contain RAQE, RAQD, RAQR, RAQI, those focus on rate of achievement. Third cluster is QI and ETR. Making well Planing & organizing will affect the quantity of achievement (Randolph & Blackburn, 1989; Mullins, 1996; Hill & Jones, 1998). This character was proved at this study that first cluster had higher relational with P&O. The rate of achievement depends on setting rational goal. We must make correct analysis and judging of environment, and then rational goal will be set (Pearge II & Robinson Jr., 1991). This character was proved at this study that second cluster had higher relational with A&J. QI needs the competence of gathering, analysis, judging and applying information (Lin, 1999). QI had high relation with A&J and C in this study. It also proves that decision and leadership affected ETR.

The relational between management dimension and management outcomes was proved by this study. The result correspond general cognition of management. There is only one case of company. It is valuable to study other case continuously. To assure the assessment center's validity and reliability with grey theory. By the way, different initial value normalization may influent the result of grey relation was discovered in this study. It's valuable to use mean value, max-value, min-value and interval value for normalization in the future study.

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EXPLORING A NEW PATTERN OF VOCATIONAL EDUCATION AND TRAINING

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Abstract: The 21st century is a new era in which information technology is developing rapidly and the demand from labor force market has broken the traditional concept of education. Vocational education and training as a life education is now regarded as a new type of educational system. But how to help this new system further develop so as to become gradually perfect is a big issue which calls for exploration in our country. We have done a great deal of beneficial exploration in this field and have founded a new Information Technology College by taking the advantage of teaching resources from Northwestern Polytechnical University (NPU), which is one of key universities in China, and the capital from two companies. It is a sub-college of NPU, but it has independent running system. We have gained initial experience in the reform of curriculum development, construction of laboratories and training center, employment of teachers, teaching quality control and evaluation. And we are willing to share them with other participants. Functional words: vocational education and training, teaching resources, teaching quality control, practice training, field school.

As the 21st century becomes a new era in which information technology is developing rapidly, the new development of high-tech, which is changing by each passing day, has broken the traditional concept of education. And vocational education and training as a life education now has developed into a new type of educational system. In "the Project of facing 21st century and vitalizing Education", the State Ministry of Education clearly points out that we should vigorously develop our higher vocational education and training, improve the technological and literature quality of all our civilians and promote employment so as to meet the urgent needs in developing our national economy. It also points out that higher vocational education must face local economic construction and social development, meet the demand of labor market, foster qualified personnel for the first line of production, service and management so as to show its unique characteristics. Therefore, the study and research of the demand in the development of Chinese higher vocational education and exploring diverse patterns of developing this new system becomes a heating topic in our higher educational circle. Based on the State Council's policy of developing higher vocational education and the strategy of developing infrastructure in western China, the school authority of Northwestern Polytechnical University (NPU) decided to found a new college at the beginning of 1999, NPU-GL Information and Technology College, and started enrollment in the same year. The new college is now composed of 6 departments with 10 specialties. From the experience we gained from practice over the past years, we'll explore a new pattern of higher vocational education and discuss some of the issues concerned.

I. THE DEVELOPMENT OF HIGHER VOCATIONAL AND TECHNICAL EDUCATION BECOMES INEVITABLE IN RESPONSE TO THE DEVELOPMENT AND NEEDS OF SOCIETY, ECONOMY, SCIENCE AND TECHNOLOGY, AS WELL AS EDUCATION.

1. To vigorously develop higher vocational and technical education is the demand to develop national economy, science and technology.

Since the 20th century, rapid development of science and technology and economy has led to a great and apparent change in social structure and occupations. This rapid development of high-tech and its wide application in various fields in national economy, as well as the rapid development of service industry, has produced a multitude of new occupations. On the other

hand, the original occupations either disappeared or divided into new branches or combined with other forms of occupations. Whatever new occupations are created and whatever vocational positions are divided into or combined with, they require high-tech and relatively higher intelligence, thus increasing the percentage of positional technique and a variety of labor skills. As a result, this new development helps vocational education develop to a new trend of higher level and produces new demand of higher vocational education.

2. **To vigorously develop higher vocational education is the demand for further development of our higher education.**

China's higher education, for a long time, seems to be a one-way system, in which students are trained for a certain discipline of specialty. This one-way system, in which students are trained in a mono-pattern, no longer meets the needs of economic and scientific development because the rapid development of science and technology has brought about short cycle of its application in production. With higher education reform further deepening, the reform of our higher educational structure becomes urgent and inevitable. Higher educational institutions should not only turn out large number of qualified personnel for the development of science and technology, as well as engineering, but also turn out qualified personnel with well-trained technique and skills, who are badly needed in various vocational posts. Meanwhile, higher vocational education opens another new channel for young people to receive higher education, thus constructing "a motorway interchange" and creating a great impact on our entire educational system.

3. **To vigorously develop our higher vocational education is to meet the demand of our social development.**

Over the past two decades, the people's living standard has been significantly improved and the government's policy of "one couple, one child" has been widely accepted both in big cities and countryside. In terms of Chinese traditional culture, parents always expect that their only child can receive better education, hoping he/she will enjoy a better life when growing up. Consequently, after their basic life necessities, such as food, housing, clothing, are satisfied, the Chinese parents try to save as much money as they can for their children's educational expenses. We, therefore, have a large educational consumer market, which is regarded as the largest in the world. It is predicted that in the coming twenty years higher education will become more popular in China, with the people's living standard further improved. As a result, more and more parents hope that their children can receive higher education after their children's completion of high school education. In order to meet this demand of broad masses and to enhance the overall quality of our entire nation, we should explore a great variety of channels of higher education so that the students' individual potentials can be fully developed and students can select their own way of development in accordance with their personality, interest, preference and their strong points. And the teachers can teach them according to their aptitudes.

The connotation of higher vocational education In its "Resolution Concerning the Deepening Reform of Educational System And Promoting Overall Quality Education" issued in 1999, the State Council pointed out that higher vocational education is an important component in our higher education and major effort should be devoted to develop it. It also pointed out that higher vocational education should turn out qualified personnel with necessary theoretical knowledge and stronger practical skills in order to meet the needs in our production,

construction, management and service industry both in urban and rural areas. From the above statements, we can clearly see the definition of connotation of higher vocational education. Furthermore, we can understand and analyze its connotation in terms of the four types of qualified personnel needed in human productive and social activities. Based on their functions in social activities, economic operation and development and the development of science and technology, qualified personnel can be classified into four types. The first is academic, who are mainly engaged in discovering rules, creating theories or theoretical and consultant work. The second is engineering, who are mainly devoted to planning, scheming and designing. The third, technical, through whose work, the work of the second type of personnel, such as planning, designing, can be changed into material things or products, causing concrete function to human's social activities. The fourth, skilled, who are mainly engaged in the work of direct operation. We can, therefore, come to the understanding that in terms of hierarchy higher vocational education is part of our higher education and it belongs to the category of higher educational system. In terms of types of qualified personnel, it is vocational and technical education and this education is based on the students' successful completion of their high school education. It trains qualified, advanced and practical personnel for the first line of our production, construction, management and service industry. That is to say, its objective is to train advanced technical and specialized personnel.

Exploring a new pattern of vocational education in NPU-GL Information and Technology College. This college is one of the colleges in NPU, which integrates the advantages of NPU, such as teacher resources, knowledge and technique in aeronautic, space and marine fields, with the capital from Shaanxi GL Printing Limited Company and GL-NPU Software Limited Company. It was founded on the cooperation of three partners and it takes the fundamental task as to train applied, advanced and specialized personnel to meet the needs of social construction. In our vocational education and training, we give priority to the students' applicable ability so as to train qualified and specialized personnel with proper basic theoretical knowledge, stronger applicable technical ability, wide range of knowledge and high overall quality.

1. Specialty arrangement

The principle of our specialty arrangement is to meet the needs of the development of our national economy, especially that of our information industry, and to take the advantages of disciplines and specialties of NPU. In the light of the above principle, the college constitutes six departments with ten specialties. They are as follows: computer, communication & network, electronic trading, information & automatic control, foreign languages and arts. Ten specialties are specified as: computer & its application, English language, communication & network engineering, electronic trading technique & its application, modern trade & business, network finance, public relationship & secretarial service (arts and airhostess training), computer aided design (CAD), automatic control & its application and information system & management.

2. Curriculum development

Our curriculum development focuses on the satisfaction of social needs and the training of ability of learners' specialized technique. So the final goal is to train qualified personnel who can meet the urgent needs in our production line and possess necessary theoretical and specialized knowledge and who can have a better mastery of English language in listening, speaking, reading. These qualified people should be able to operate personal computer work with Internet and have practical skills and technique in their own specific fields. They should

also possess the spirit to undertake pioneering work and a better vocational moral standard. And they are cooperative and healthy both physically and psychologically. The corresponding principles of our curriculum development are as follows:

1) Curriculum development should not only be adjusted to the demand of social development, but also to that of socialist market economy and information technology.

2) The relationship among knowledge, ability and overall quality should be properly handled and a good balance among vocational ethics, intelligence, physical health and aesthetics should be well kept.

3) Priority should be given to applicable and practical curriculum. And proper percentage of basic theoretical courses, courses of specialties and field practice should be taken into account.

4) Experts in corresponding industries, enterprises and business should be invited participate in curriculum arrangement, classroom teaching and lab work. And contact should be established with them.

5) We should fully realize the unique characteristics of vocational education and closely combine theory with practice, knowledge with ability training and concentrate on the ability training through all the teaching and learning activities.

3. Construction of the field school

Teaching and learning practice is of great importance in all the teaching activities if vocational education shows its unique characteristics. Practice time in all the specialties is made up of about 40% in all classroom teaching and learning activities. Meanwhile, we strengthen the construction of practice and training center which is located in the training center building which serves as campus network center, TV program broadcasting center, as well as communication center. Installed on the top of this building are the radio communication antenna, TV receiver antenna and radio call station antenna. Inside the building, there are 10 labs (computer, foreign languages, electronic technique, automatic control, communication, network, information, multi-media, multiple purpose and basic theory lab) and one cabled communication center. It also has 6 training school centers (electronic training, designing and manufacturing, computer component installation, software development, scientific and technological making, super market and bank), 2 exhibition rooms (computer development and information technology development), 2 large PC centers used for students' training and practice as well as graduation project.

The new college can take the advantage of association and connection established by NPU with industries, enterprises and companies for scientific research and cooperation in aeronautic, space and marine fields so as to build up its own outside field schools with them. At present, it has field schools in GL-NPU Software Development Limited Company, Xi'an Aircraft Building Company, Chengdu Aircraft Building Company and Northwestern Airline Company etc. Further more, the new college will establish close ties with some scientific research institutions, companies, department stores and banks so as to provide ideal practice and training centers outside school.

4. Construction of teaching staff

In order to ensure teaching and learning quality, both experienced professors, associate professors and experienced engineers, technicians and managers from industries or companies are invited to be instructors for the college. Graduate students working for master or doctor

degree are also invited to be tutors. Now the new college has 4 full-time instructors, 32 concurrent, among whom, 11 are professors, 5 associate professors, 2 lecturers, 4 teaching assistants, 8 graduate students for doctor degree and 5 for master. The teacher and student ratio is now 1:13. Our teaching staff will be expanded as the student enrollment increases. On the basis of the characteristics of vocational education, the teacher and student ratio is set as 1:20 with teacher combination of full-time and concurrent instructors, but with the concurrent as the main force, Among the teaching staff, full-time instructors will account for 25% and concurrent for 75%. We will also make a better use of teaching resources from the departments and colleges in NPU. Especially, we will select and invite instructors from scientific research staff and lab technicians so as to take advantage of their strong points. Some best students with better overall quality, who will graduated from this college, will be encouraged to be come teachers here and opportunities will be provided to them for further education if they want to work for further academic degree. Teaching methodology is emphasized and we will try to establish a teaching staff with "two-functions", that is, teachers serve as classroom instructors as well as engineers in the practice and training center. In this way, responsible and efficient teaching staff can be formed.

5. Teaching quality control system

Teaching and learning quality is the lifeline of the college and this quality depends on teacher quality and responsibility, as well as school administration. Therefore, we have drawn on the experience of NPU and established a set of complete teaching quality control system with the characteristics of higher vocational education. Furthermore, research work will be carried out on the system.

1) Teachers' reward system

On the basis of their contribution, moral standard, vocational capacity, the teachers will be regularly evaluated both by students and school authority. Those who work hard with better teaching effect will receive a reward in the end of the academic year in addition to their regular pay. Those who are not responsible or are not qualified in their teaching work will be fired.

2) Establishment of relatively perfect and strict regulations and rules in teaching quality control

Standard teaching administration plays an important part in the improvement of teaching quality control. So the college has set up and issued several regulation, such as "Students Manual", Teachers Manual" and "Regulations of Teaching, Administration and Service for the Purpose of Fostering Students". Each staff member and student has respective copy so that every work is carried out in accordance with regulations.

3) Regular assessment and evaluation

Mid-term and final term assessment should be regularly carried out at the level of teaching group and departments, in which both students and teachers should participate. Effective measures should be taken if any problems are found in teaching and learning process.

4) Optimizing teaching program

Teaching content should be constantly updated and optimized to keep pace with the development of science and technology, especially that of information technology, as well as the demand of labor market. And qualified personnel from related industries, enterprises and business are invited to participate in the above activities.

6. **The establishment of a cooperative system in running the college**

The new college has a completely new running system in which the dean is responsible for decision making under the leadership of Board Committee. This system emphasizes the cooperation with industries concerned so that classroom teaching can be closely combined with development of society, production, science and technology so as to absorb new technique and scientific achievement. It has an independent finance accounting from NPU and the service work done by specialized companies in the society.

The founding of this new college has been sponsored and supported by all sides from the society. We have made great achievement, but also run into some difficulties. We'll share our experience with other participants and solve our problems with their help.

TRANSFORMING EDUCATIONAL PRACTICE FOR A TRANSFORMED EMPLOYMENT ENVIRONMENT

Jeanne Dawson
Curtin University of Technology, Western Australia

Index: 'Employment-ready' graduates, communication-related skills, discursive learning model

Abstract: Major transformations in the globalised management accounting profession have put pressure on accounting educators to produce 'employment-ready' graduates with a range of communication-related skills. Many past efforts to develop undergraduates' communication skills have been compromised by curriculum designers' reductive approach to 'communication' and the tendency to teach communication skills in isolation from or as an adjunct to the discourse of professional accounting rather than as an already integral element. This paper critiques two models for teaching communication skills within accounting programs, and then presents an alternative, 'discursive' model. It outlines features of this 'discursive model' through reference to a case study.

INTRODUCTION

The ways in which technology and globalisation are transforming the technical and professional workplace are many, various, and complex. In equipping students with the essential knowledge, skills, and attributes to undertake employment in their field, educators must be well-informed about these transformations and update their educational practice to ensure that graduates' skills meet the challenges of a changing workplace. This paper addresses one challenge: the need for more sophisticated communication skills.

TRANSFORMATIONAL TRENDS IN MANAGEMENT ACCOUNTING

In August 1999, the U.S. Institute of Management Accountants published a report, *Counting More, Counting Less: Transformations in the Management Accounting Profession,* which identifies major changes to the role and activities of managerial accountants today. While the report identifies changes specific to the management accounting field, its findings are directly relevant to the general educational task of keeping up with employer requirements within an increasingly competitive global environment.

In a survey of 500 major companies the report found that accountants are spending *more* time on the communication-related tasks of interpretation, analysis, and decision making, and *less* time on the procedural tasks of collecting and compiling information and preparing routine reports. Since there was already a perceived shortfall between employers' requirements and accounting graduates' proficiency in communication (Mathews, Brown, and Jackson, 1990; Bedford, N. et al., 1986), the *Counting More, Counting Less* report reminds accounting educators that if they are to produce 'employment-ready' graduates, they must be more effective in teaching a range of communication-related skills at a more sophisticated level (ASPCA, 1996; AECC, 1990; Macve, 1990).

Most accounting degree programs do address communication skills, but the way in which these skills are included in the curriculum needs to be updated to equip graduates for employment. The two models most widely used are the **'service'** and the **'integrated'** model. These models do offer some practical benefits, but they are no longer adequate to prepare students for the transformed workplace they will be entering as graduates. To overcome some of these models' inadequacies, a third, **'discursive'** model has been developed.

1. The 'Service' Model

Until the 1980s, schools of accounting tended to rely upon a generic 'service' model for developing undergraduates' communication skills. Typically, 'service' courses were externally taught and administered. Scheduled in accounting undergraduates' first year of study, 'service' courses covered such skills as essay- and report-writing, presentation techniques, and general literacy. In this model, responsibility for students' learning of communication skills was perceived to lie not with accounting lecturers but, on the contrary, with outside communication experts. The communication skills taught in such courses might be applicable to accounting, but they were not intrinsically related to ways of communicating and thinking about accounting.

Even though schools of accounting recognised the importance of communication for their students, they tended to marginalise communication courses offered within the 'service' model as, at best, peripheral to students' accounting education and, at worst, remedial. Certainly, little incentive was offered to accounting educators to become involved in consolidating, reinforcing, or further developing the communication skills that students acquired in the 'service' course. This lack of engagement with communication teaching perhaps helps to explain the results of Rebele's 1985 study, which found that accounting students who were taught communication skills through the 'service' model did not perceive written or oral communication skills to be of major importance to professional success (Rebele, Stout, and Hassell, 1991).

2. The 'Integrated' Model

Throughout the 1980s, accounting educators, especially in the U.S., came to recognise that if accounting students' communication skills were to be improved, they had to be contextualised as integrated professional skills - not as an optional extra or as a remedial exercise but as one of the sets of skills and knowledges essential to the graduate's success as a professional accountant.

Among the more prominent advocates of the integrated model during the 1980s were May and Arevalo at the J.M. Tull School of Accountancy and Hirsch and Collins at South Illinois University at Edwardsville. May and Arevalo (1983) and Hirsch and Collins (1988) both emphasise the importance of integrating writing skills with technical accounting knowledge within a traditional accounting unit, and Hirsch and Collins further advocate applying the model across three sequential units to reinforce learning.

A key element of both these integrated accounting/communication programs is the collaboration between an accounting instructor and an communication instructor: the collaboration involves a fifty-fifty split between the two instructors in their direct input to students. Bringing together accounting and communication in one unit is obviously a great improvement over the 'service' model, but it still presents the relationship between professional knowledge and its articulation through language as two separate discourses: accounting *and* communication. In doing so, it ignores the fact that the cognitive structure and language of accounting *is* accounting no less than accounting facts, figures, and practices; the communication of accounting is *not* identical with the communication of other professional disciplines (Agger, 1991).

This last point merits further elaboration. It begins with the notion that accounting, like all professional disciplines, is a *discourse,* and here the word 'discourse' is used in the sense that Michel Foucault explains in *The Archaeology of Knowledge* (1974) and subsequent studies. 'Discourse' is a notoriously difficult term to define simply and precisely, but, drawing on the insights of Mikhail Bakhtin as well as Foucault, Roger Fowler (1990, p.54) offers a useful definition. Fowler writes that discourse is

> speech or writing seen from the point of view of the beliefs, values and categories which it embodies; these beliefs ... constitute a way of looking at the world, an organisation or representation of experience....

When we speak of accounting as constituting a discourse, therefore, we are referring not only to its technical and conceptual 'content' but also to the language which articulates and embodies this 'content'; indeed, there can be no content without the language of words and numbers through which it is conceived, thought about, and communicated.

In presenting accounting and communication as complementary discourses, the integrated model bifurcates the accounting discourse, creating a false dichotomy. There are, as both May and Arevalo and Hirsch and Collins explain, sound practical reasons for the accounting class to have direct instruction from the communication expert, but the presence of this expert inevitably supports the false impression that the means of articulating the accounting discourse lies *outside* the discourse in the complementary but no less discrete discourse of communication studies (Dawson, 1996).

3. The 'Discursive' Model

In contrast to the 'service' and 'integrated' models, the 'discursive' model recognises communication to be inseparable from the accounting discourse. The model was developed as part of an action research project in a second-year undergraduate managerial accounting unit in the Curtin School of Accounting. The aim of the project was to integrate students' learning of communication skills - in particular, their oral presentation skills - with their learning of contemporary management accounting concepts and strategies. The project was facilitated through collaboration between a communication specialist and the subject coordinator, with the support of three lecturers in the subject.

Having observed the shortcomings of the 'integrated' model, the project facilitators kept the focus of the unit clearly and unequivocally on managerial accounting; it was essential that the presentation skills component of the unit should neither disrupt students' learning of managerial accounting concepts nor be perceived as a discrete 'add on'. It was agreed that the presentation skills that students acquired during the unit were not an end in themselves but, rather, a means of articulating, sharing, and monitoring what they were learning about managerial accounting concepts. The approach taken was informed, in part, by insights from the Langer and Applebee (1987) study of the ways in which students *learn through writing* (as opposed to *learning to write*).

The communication specialist's role was to provide teaching and assessment resources for the managerial accounting lecturers and to discuss implementation strategies with them; there was no direct contact with students in the unit.

The project facilitators' decision to address presentation processes rather than the writing processes discussed by Zinsser (1988) and McLeod and Soren (1992) was arrived at in discussing the learning objectives of the unit. The subject coordinator and the three lecturers were given a self-assessed Teaching Goals Inventory (Angelo and Cross, 1993), and asked to identify instructional goals they believed to be 'essential' - that is, goals they tried to achieve 76% to 100% of the time. In responding, they were asked to think about these instructional goals primarily in terms of equipping

their students for the 'real life' world of professional employment. The result of the TGIs was a consensus on the importance of the following four goals:

- developing students' ability to synthesise and integrate information and ideas;
- improving students' listening, reading, and speaking skills;
- facilitating students' learning of the subject's concepts, theories, perspectives, and values; and
- developing students' ability to work productively with others.

GROUP PRESENTATIONS

From this result, the project facilitators decided that group oral presentations of a series of academic journal articles would be an appropriate focus for these particular teaching goals. Students were required to read five journal articles and to submit well-structured summaries of three of these for part of the presentation assignment grade. They then had to choose one of the journal articles they had read and/or summarised and share the salient points with the rest of the class in a formal presentation.

The communication specialist provided the lecturers with instructional material, newspaper reports and short articles discussing the importance of presentation and oral reporting skills for the business professional, some 5-minute exercises to help students practise their delivery technique, additional 'tips and hints', and sample holistic marking guides for lecturers and for peer assessment.

One of the immediate objectives of the project was to ensure that each group's presentation was a quality learning experience for the whole class - and not just the presenting group. In outlining what was required in the group presentation assignment, the project facilitators explained that the principal objective of the assignment was to *disseminate to their colleagues* information that the group had gathered, processed, and evaluated. It was stressed that the success of the presentation depended not on the amount of detail that was included, nor on superficial aspects of delivery, but, rather, on the integrity of the processed material and the effectiveness of its transfer to the audience. Students were encouraged to focus not only on the audience's need for information but also on their capacity *as listeners* to receive and assimilate this information.

The instructional material given to students emphasised the importance of structure to a successful presentation in terms of guiding the audience logically and methodically through the material being presented. Because of this emphasis on structure, students were made more aware of how the journal articles to be presented were themselves structured: how they used headings and subheadings, paragraph transitions, and linguistic markers to organise their topic. Students' increased awareness of structure was reflected in the summaries they submitted, suggesting that the lecturers' emphasis on structure had positively influenced the way students read the articles. As well as noting individual points being made, these summaries showed some evidence that students had both identified patterns and connections between points and had an appreciation of the article as a well-organised whole. This suggests that students were adopting a 'deep' learning style (Biggs, 1987), the basis of life-long learning.

Moreover, through their practice of reading, summarising, and presenting managerial accounting concepts in a clear, coherent, and logical way, students were not simply learning *about* professional discourse; they were also actively participating in it. Open-ended feedback indicated that, as in earlier surveys, students found the task of reading and summarising the journal articles somewhat arduous, but there was a greater awareness of the relevance of the task to professional practice.

GRADING AND PEER FEEDBACK

At the beginning of the project, the accounting lecturers expressed some concern about grading presentations and giving useful corrective feedback. While they were confident in their ability to evaluate the 'content' of presentations, they felt they lacked the expertise to comment on specific aspects of the form and delivery of this 'content'. This problem was addressed by training the lecturers in the use of a **holistic grading** scheme. In this form of grading, key areas (content, structure, and delivery) are identified but not given separate grades; grades are allocated according to where the assignment fits into a descriptive continuum (Dawson, 1998): 'excellent (8+/10), 'very good' (7/10), 'good' (6/10), 'satisfactory' (5/10), 'poor' (4/10), and very poor' (3/10). With practice, lecturers gained confidence in their own judgement and reported that students believed they were fairly graded.

Because the success of professional presentations in the workplace must ultimately be measured by the effectiveness with which they disseminate useful information to an audience, the class was asked to fill in an evaluative feedback sheet for the presenting group. This feedback sheet was passed directly from the audience to the presenters; the audience was not asked to assign a grade but only to make constructive criticism. In asking the audience to respond in this way, the project facilitators once more underscored for students the fact that in professional practice presentations are not simply demonstrations of the accountant's knowledge and expertise; they are also essentially about re-processing and re-articulating accounting information for a specific audience.

CONCLUSION

The discursive approach briefly outlined here is more than just another method of delivering instruction on communication-related skills to accounting students. In fact, it represents a shift *away from* the notion that accounting is about a static and isolated set of facts, knowledge, and procedures *towards* an understanding that accounting is a dynamic discursive practice (Bailey and Benz, 1991). Such an understanding is essential to the success of every graduate entering the transformed - and constantly transforming - employment environment of today and tomorrow.

Acknowledgement: Thanks to Mr Bob Carson, who co-facilitated the 'discursive' model project described in this paper.

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PRE-AND POST-ASSESSMENT IN OCCUPATINAL COURSES

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Index: Competency approaches, assessment, standards

Abstract: In the United States, demonstration of a vocational education teacher's ability to teach academics (reading, writing, math, etc.) is essential in many states. Vocational teachers need to show students' learning gains within their content areas along with how they contribute to the teaching of academics. This session will present how to use a pre-post test system to document academic and content learning gains. Examples of academic skill documentation and teacher-made pre-post assessments will be shared.

INTRODUCTION

Assessment is a part of a student's or teacher's every day life. In the United States, state departments of education are developing tests to determine academic levels of their students based on state-developed standards. This charge was in response to the U.S. Secretary of Education's call for higher education standards for all students as well as parents, legislators, and the general public wanting schools to be accountable for students' learning. The hoped for end result is that with U.S. students meeting higher standards, they will be able to successfully compete within global educational and work environments.

Data indicates problems with the current system of education in providing a base level of academic skill suitable for success in the U.S. workplace. According to the National Institute for Literacy (NIFL) (2000), American businesses are estimated to lose over $60 billion in productivity each year due to employees' lack of basic skills. Of the American companies polled by the NIFL, 47% reported that their workers lacked basic math skills and that 71% reported that basic written communication training was critical to meeting their workplaces' skill demands.

With the increasing focus on academics, students have started to complete fewer vocational or occupational education credits at the high school or secondary level. According to statistical information summarized from U.S. Department of Education's Vocational Education in the United States: Toward the Year 2000 , from 1982 to 1994, high school students completed fewer vocational credits (down to 4.0 in 1994 versus 4.7 in 1982) and the number of students completing a concentration of vocational courses in an occupational area had also declined ("Statistical Abstract," 2000). As to academic preparedness of vocational students, the study found that in 1994 only 33% of vocational students completed the basic core academic standards in high school (four years of English and three years each of math, science and social studies.) The preliminary data indicates that in 1998 approximately 45% of vocational students were meeting these standards. Even though the percentage of vocational students completing basic academic requirements seems to be increasing, all vocational students need to demonstrate basic reading, writing, math, and science (as necessary) competencies.

An important fallout of the increasing emphasis on academics is the narrowing of the curriculum, i.e. elimination of courses that don't contribute to a student's academic competence. This reaction could be particular potent in smaller schools with limited resources. To maintain

vocational courses and programs in high schools, teachers need to demonstrate how they contribute to students' academic skill development as well as their vocational competence through appropriate assessments.

ASSESSMENT

Assessment is defined as "a process of collecting data for the purpose of making decisions about individuals and groups" (Salvia and Ysseldyke, 1998, p.5). Assessment instruments range from standardized tests to classroom tests. The instrument used is only part of assessment process. When students are assessed, teachers and educational institutions consider the way students perform a variety of tasks in a variety of settings or contexts, the meaning of their performance in terms of the total functioning of the individual student, and the likely explanations for those performances. When students are assessed, their competence is being measured.

The focus of this paper is the need to access academics and vocational content in the context of the vocational classroom or in the workplace. Considerations in the construction of possible teacher-made assessments to demonstrate meeting academic and vocational content standards will be highlighted.

ASSESSMENT CONSIDERATIONS

In the U.S. Vocational Education Performance Standards and Assessment Techniques report (McCaslin and Headley, 1994), high school proficiency exams were the commonly used technique for assessing basic academics while portfolios and program completion were used more frequently to assess advanced academics. About two-thirds of the states at the secondary level used something other than nationally developed techniques for assessing academic skills. Work skill attainment was assessed by locally selected or developed techniques at both the secondary and post-secondary levels.

Most academic assessments utilize an objective-analytic approach. With this approach, teachers systematically assess the key components of performance and the key elements within each component. For example, a teacher requires that a student develop a resume. The key components and elements the teacher might look for could include the following:

1. Gather information on work experience, education, and awards.
    a. List places where worked, supervisor's name, dates of employment, job title, and duties
    b. List education experiences including special courses of study, majors, and graduation dates.
    c. List awards and honors received.
2. Use appropriate layout and grammatical rules for resume.
    a. Resume format uses bold, indents and fonts in a consistent manner.
    b. Resume includes the categories of personal information (name, address, phone number), education, work experience, and awards.
    c. Resume content is organized in an effective, understandable manner.
    d. Resume uses phrases versus complete sentences.
    e. Resume is one page long.
    f. All material is spelled correctly.

g. The resume is typed.

After identifying the key elements in the task, the teacher can then develop objective scoring standards to assess student performance. Scoring is based on observable performance or products with criteria that applies to all students. Students (and the teacher) will then know what mistakes have been made and how to improve performance.

Often teacher-made tests are not held in high regard. However, teacher-made tests can be better suited to evaluate student achievement than commercially prepared norm-referenced tests. A teacher-made test can match the curriculum being taught and be sensitive to individual student differences. Teachers who are concerned with pupil mastery of specific concepts and skills are in a position to test a narrow range of competencies directly and frequently through teacher-made tests. A teacher's test is the key to understanding the teacher's curricular intentions.

For a teacher-made test to be useful as an assessment, the assessment must "standardized." For a teacher-made test to be standardized, tests should use consistent directions, criteria for scoring, and procedures. Competencies and outcomes need to be clearly specified along with what level of performance is acceptable.

Tests also need to be reliable and valid. For a test to be reliable, the test should consistently measure whatever it is suppose to measure from administration to administration. To aid reliability, precise scoring guides should be used. Validity looks at whether the test is measuring what it is suppose to measure. The most important type of validity for a teacher to consider is content validity. A test has content validity if the test measures the specified competencies and provides scores that tell whether the student has mastered the competencies or not.

To help teacher-made tests meet these characteristics, Salvia and Ysseldyke (1998) suggest the following:

(1) the test covers on specific, important content information,

(2) the questions asked are relevant to the content,

(3) the way that the questions are asked are familiar to the student,

(4) questions are sequenced in a logical manner, i.e. easiest to hardest or by competency,

(5) test items are group by similar types (multiple choice, short answer, demonstration, etc.),

(6) directions are clearly written,

(7) systematic procedures are development for scoring responses, and

(8) criteria are established to interpret student performance, i.e. weighting of questions and assigning of mastery levels.

WHY CONDUCT PRE- AND POST-ASSESSMENT IN VOCATIONAL CLASSES

Assessment of the academics in vocational classes is imperative. Historically many students have shunned vocational courses and programs because of the perception that they will not prepare them for admission to four-year colleges and universities. Today vocational programs tie vocational classes and work experience to non-vocational subjects, including math, English, science and social sciences (Stern and Rahn, 1995).

Literacy of workers is an important issue for businesses. Students need to understand the information presented in text and graphic format similar to those found in the workplace. They need writing skills to report observations and data collected, complete forms, and write memos and

reports. Conducting pre- and post-tests allows teachers to show learning gains within their content areas along with how they contribute to the teaching of academics.

PRE-TESTS

A pre-test is a snapshot. A pre-test will provide information about what students know and don't know. With that knowledge, a teacher can develop appropriate learning strategies. According to Camp (2000), several small pre-tests that are specific to a content area are better that standardized tests in aiding teacher's teaching. By practicing assessment in the classroom, teachers will better able to understand and promote learning and increase their ability to help students to become effective, self-assessing students (Angelo and Cross, 1993).

The pre-test and post-test should be equivalent. That is they should cover the same objectives, use the same test directions, cues, and testing formats. Pre- and post-testing of content to determine learning gains can both be formative in nature. An additional summative evaluation of content via a performance or authentic assessment as a portfolio or completed project can be used at the end of a unit with pre- and post-tests being used through the unit instruction.

The pre-test should be evaluated on its reflection of the competencies to be tested, scorability, and feasibility. The pre-test that is difficult to grade (either by type of questions or type of assessment as a performance-based assessment with a class of 30) or takes too long to complete is not useful to the teacher. The pre-test sets the stage for the documentation of learning gains in content and academic areas.

THE PROCESS OF ASSESSMENT FOR LEARNING GAINS

The first step in documenting academic skill growth is to identify the academic skill requirements for your state or country and look at how these skills can be documented. Possible assessment strategies include observation (as with oral presentation skills) and teacher-made tests (to assess writing, math, and reading comprehension skills). Of course, performance or authentic assessments as portfolios, product-based learning, and demonstrations can be used but may be too time consuming to be used as formative evaluation in a pre-test. However these assessment strategies are appropriate for summative evaluation.

In the state of Colorado, three levels of standards exist: (1) academics, (2) general occupational skills (SCANS skills), and (3) specific occupational skills. Students can be pre- and post-tested on any appropriate subset of these standards every week. Pre-tests will inform teachers on what to teach and provide the benchmark for learning gains.

Effective pre- and post-test procedures need to be established. A suggested procedure to be followed is:

(1) identify the standards/competencies that you wish to pre-post test,

(2) develop an instrument that allows one to determine the student's level of skill or competence,

(3) establish an effective administration procedure,

(4) analyze the results, looking for gains and areas of low mastery, and

(5) report the results in an understandable manner.

SUMMARY

By using pre- and post-tests to document learning gains in academics along with gains in vocational content areas, vocational teachers show how they contribute to students' learning of academic subjects and support the general education mission at the secondary level. This documentation should help build a case of maintaining vocational courses at the secondary level and thereby prevent the narrowing of the high school curriculum. The documentation of academic skills will also indicate to businesses how the schools are meeting basic skills through vocational programs.

Note: Session participants will receive examples of pre-post procedures for one week and teacher-made pre- and post-assessments in various academic areas.

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TRANSFORMING YOUNG SCHOOL LEAVERS AND MATURE UNEMPLOYED INTO SKILLED IT WORKERS – THE IT ASSISTANT TRAINING IN HONG KONG

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Index: Employability, IT Skills Training, IT Assistant

Abstract : This paper attempts to review the "IT Assistant Training Program (ITAT)" in bridging the gap between IT manpower need and the employability of young school leavers and mature unemployed in Hong Kong. It will inspect ITAT in a detailed manner in the aspects of planning, collaborations, curriculum development, administration, pedagogical considerations and job placement. The effectiveness of the program, in terms of job fulfillment and added value of IT knowledge, will also be discussed. To conclude the paper, the value of continuity and the possibilities of evolution of the program will be highlighted.

THE GAP

In recent years, a gap, which is growing wider and wider, is observed between the supply and demand of IT manpower in Hong Kong.

In the information era, the supply of IT manpower is of paramount importance for Hong Kong to turn into a knowledge-based and high technology society. The recent boom of E-commerce further poses serious demand in the manpower with Web/Internet know-how. Although such need in IT manpower had been prevailing for quite a number of years as reflected by the bi-annual IT Manpower Survey conducted by the Vocational Training Council (VTC), the recent situation can be both distinguished in terms of the number and the spectrum of shortage. According to the recent report submitted by the PriceWaterHouseCoopers for the "Manpower and Training Needs of The Information Technology Sector" which was commenced by the Education and Manpower Bureau (EMB) of the Hong Kong Special Administration Region (HKSAR), it is predicted that there will be around 17,000 and 56,000 (high-end estimates) sub-degree level manpower shortfall in the coming 5 and 10 years, respectively. At the same time, as we are marching into the Internet/Web era, with the penetration of IT into every aspect of life, the varieties of IT jobs had been diversified greatly into job opportunities across various education levels, with many of them are suitable for secondary school leavers who are not successful in pursuing further studies. This is well different from the need of mainly degree graduates IT professionals in the past.

So this is just one side of the gap - the demand side.

The availability of the IT jobs is just one side of the story. The labour market in Hong Kong is now facing a very critical challenge. Many of the workers with skills in traditional industries lose their jobs when Hong Kong is turning its economy from industry-based to finance and service-based in the past years. The problem is even more severe for young school leavers. According to government statistics, more than 20,000 participants in the Hong Kong Certificate of Education Examination (HKCEE) got the result of failure in all attempted subjects. Also, about 25 to 30% of these young school leavers are unemployed.

So this is another side of the gap - the supply side.

Ironically, it is apparently that there exists a mis-match between the IT manpower shortage and the supply of abundant manpower of young school leavers.

BRIDGING THE GAP WITH SPECIAL FOCUSED TRAINING – IT ASSISTANT TRAINING PROGRAM (ITAT)

In order to bridge the apparent gap for betterment of the society, the EMB of HKSAR initiated a 10-week full time IT training for F.3 to F.5 school leavers and unemployed mature people. If we believe academic results are not the only yard-stick in measuring the capabilities of people, ITAT will help in bringing some concrete paths for those who have aptitudes in IT. The pilot phase runs from Feb to July 2000 with 300 trainee places. The course contents cover topics in Office Applications, Basic Web Development, E-commerce Operations, Multimedia Production, Internet Support, Networking and Soft Skills. The graduates are suitable for assistant level jobs in IT like IT Assistant, Internet Support, Junior Technician and Web Assistant. The course is basically free. Trainees have to pay a deposit of $1,000 which is refundable upon 90% attendance and pass in the overall assessment.

THE STEERING COMMITTEE

The ultimate purpose of ITAT is bridging the gap as mentioned. To make the program tackle right, a steering committee with EMB officials, program implementers (VTC and ERB) and industry representatives was formed. Several meetings were held in 4th quarter of 1999 and after further consultation with more industry representatives, the course structure (Appendix I) was formulated in Jan 2000. IT Training & Development Centre of VTC (ITTDC/VTC), with bunch of experience in IT Training since 1986, was designated as the Program Manager of the whole program responsible for major course development, quality assurance, train the trainers, admission, administration and implementation. The steering committee continues working in course review and placement monitoring. In retrospect, this triangle formed with government, employers and training providers is a good system for optimization of the planning and monitoring of the whole program.

APPLICATION AND ADMISSION

The announcement of ITAT in Dec 1999 resulted in overwhelming response. Over 3200 applications were received. This reinforces again the belief of IT prominence in Hong Kong. The first batch of trainee places is 300. In order to select the right candidates, and also in line with common practice in IT courses, aptitude tests were conducted in Feb 2000. The applicants with satisfactory test marks were invited for subsequent interviews. Each board of interviewers consists of a representative from the industry and another one from the training providers. Major aim of the interview is to find out the attitude, maturity and the commitment of the trainees. This is very important in view of ITAT is placement-tie. At last, 300 applicants were selected and allocated to various classes from Feb to Jul 2000. The classes were formed with best homogeneity in education level and age to lead to best pedagogical effect.

COURSE DESIGN, ADAPTATION AND TRAINER CONSIDERATIONS

Course contents were adapted specially for ITAT. The technicality and concepts were specially tuned to suit for the education level of F.3 to F.5. A team of over 10 training officers of ITTDC/VTC was deployed for the course development. Outside parties (e.g. YWCA, CityU Consultancy Ltd, independent consultants) were responsible for development for some of the topics like Soft Skills, Preparation for IT and Multimedia topics. About 50% of the time is dedicated for practices and laboratory exercises. Intensive training sessions were arranged for the trainers. Selection of trainers is based on technical knowledge and most importantly, the teaching experience and skills. After all, ITAT is not a very technical course and the successful conveyance of the contents/skills to the trainees in the limited time of 10-week intensive training is of most important concern. The course is designed to be conducted in Cantonese, but with handout and software mainly in English. It is considered that IT works involve heavily the familiarity with English in the technical terms, manuals and working environment. We would like the trainees to "feel comfortable", though may be not very competent, in English so as to help them to fit in the working culture of IT. As a supportive measure, more abundant time in lessons was planned for discussion on English terms and a glossary with Chinese translation was prepared for some of the commonly used IT terms.

THE RUNNING OF ITAT

As expected, the running of ITAT faces hurdles to be overcome.

Intensity is one of the major hurdles. Learning rhythm for secondary students is seldom like ITAT - 9 to 5 for Mondays to Fridays and half day for Saturdays. The trainees may get difficulties in settlement of knowledge and reinforcement of skills. It was observed that they need some time to adapt to such mode of intensive training. After several weeks, the situation becomes better especially when the course reaches some longer, practical oriented modules like Basic Web Authoring. In view of the situation, tutorial sessions on every Tuesday and Thursday evening were added. Such sessions provide a more relaxed environment for the trainees to review the contents of the modules and foster a more amicable relationship between trainers and trainees.

Language is another barrier. In fact, the trainees paid their efforts in finding out the explanations for various English terms. The whole trend resembles the issue of intensity very much - it is observed that the trainees are more adapted, though still feeling very challenged, towards the middle of the course. They agreed that English orientation can help them fitting in IT jobs, but at the same time it's tough for them to cope with.

Difference in learning paces. With classes of over 20 trainees and various education level and age groups, it is inevitable that there is variance in learning paces within a class or among classes. Constant feedback from trainees' evaluation forms for each module, observation and appropriate follow-up by trainers, review meetings held with trainers are ways for the modulation and optimization.

Overall speaking, the running of such pilot program should be put in a very dynamic context for instant adjustment and rectification. The role of Project Manager is thus of paramount importance in such context.

ASSESSMENT

The assessment is 2 fold. Every Saturday, there is a multiple choice based test to assess the basic but practical knowledge of the trainees. A review session will be held before the test. It is useful for the recapitulation of the contents of the modules especially in such intensive training for trainees of F.3 to F.5 education level. At the end of the course, there is a final practical test of 2 hours. Trainees have to produce a "not so complex" Web site within the time limit using techniques in HTML, Web Authoring Tool and some resource files in animation and images. It is quite a challenge for them as some integration technique has to be employed in the time-limited test. Most of the trainees are very serious in preparation for this final assessment. They are willing to stay behind after lessons to join the tutorial sessions for revisions.

JOB PLACEMENT

The first 3 classes of 66 trainees finished at early May 2000. Among them, 60 were successful to graduate. Another about 119 trainees graduated (among 124) throughout May and early June 2000. The final batch of 110 graduated in Mid July 2000. The placement rate up till now is over 50%.

The placement process is the ultimate verification of the program. It is believed that the market can accommodate junior IT workers, or workers who know basic useful IT knowledge in computer applications, Web/Internet skills good for a modern office environment. It is observed that such market need really exists. The only question is how big is the market and the growing rate of it ? Some more concrete survey data may help in more understanding on this aspect.

In view of the importance of placement, there is a 3-day Soft Skill module covering topics in human communications, job seeking and communication skills. Such techniques are introduced, practiced and reinforced through vivid case study, role-play and games. In terms of support and facilitation, 3 Placement Officers were employed to assist the trainees in job seeking. Well before the graduation, information of ITAT was sent out to potential employers through chambers of commerce, various associations and by reference to databases. Counseling and job matching was also carried out. All graduates get a free email account and a login for ITAT Internet based forum for receiving job information and experience sharing.

The graduates entered the market in many job positions : Internet Support Officer, IT Assistant, Junior Technician, Clerk (IT knowledge needed), Web Designer, Web Assistant, Network Engineer Trainee, etc. The salary ranges from HK$5,000 to $12,000. Much of the knowledge in ITAT can serve as the foundation knowledge in their jobs. For instance, concepts/terms in Internet networking helps in the work of Internet Support Officer and Web Authoring knowledge will help in Web Designing jobs. When we met with the graduates (they came back quite frequently for job applications and chatting), we always encouraged them that stepping into the IT field needs some dedicated effort - the knowledge learnt in ITAT is just a beginning for stepping in, and constant upgrade through lifelong learning is the right attitude to take.

There are quite a lot of exciting and encouraging cases. Ah Lai was one of the trainees of F.3 education level. He had some working experience in Real Estates Agency and sales before joining ITAT. His commitment and learning attitude in the course was well appreciated by the trainers. Immediately after graduation, Ah Lai was employed by a telecommunication company in Internet Support with monthly salary over $10,000. Originally the job needs qualification of F.5 minimum, preferably F.6 or higher. It was Ah Lai's effort and the market need which make the case come true. When I met Ah Lai and talked about networking, broadband and TCP/IP, his fluency in such topics gained through a week of internal training impressed me very much. Getting the right

attitude, Ah Lai will become a real Internet Support professional in not a very long time.

We plan to issue questionnaires to the graduates after they graduated for half a year to see how they are going on with their endeavours. The summary of such on-going survey will give more reflections for considering future direction.

THE DIRECTION

The government has secured the fund for 1000 more trainee-places per year for 2000/01 and 2001/02. The course structure was renovated to have an assessment of incremental on-going project in Web site development for better integration of skills learnt. Some more tools and streams were added like Hardware Support Stream. More Chinese translation of terms is also incorporated.

To benefit more people, some of the modules were (and will be) transformed to Web-based mode. This anytime, anywhere and self-paced mode can lead to more participation in the program. However, care must be taken to ensure the effectiveness of the new mode of learning, including adequate face-to-face seminar/tutorial support, warm-up sessions for adaptation to Web-based self-learning mode, suitable motivation and ample practical sessions. Relevant tests needed to be developed for formal and standardized assessment of the participants. The timely establishment of the IT Skills Assessment Centre serves such purpose.

The whole meaning of the program still lies in the need of the market. Relative to the training side, the employers of the industry and owners of the SMEs are expected to be more aware, as time goes time and with more appealing awareness programs available, of the importance of IT in their business and start their steps in trying to employ some IT Assistants in their office.

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DISCUSSION AND DESIGN OF HIGH VOCATIONAL EDUCATION

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Key words: Work, discussion, design

Abstract: To set up a vocational technical college within a university is in accordance with the tendency of international high education. It is an important and practical move to develop high vocational education based on China's realities. Although there is much controversy on decision-making and difficulties in operation, in a sense and in a particular period of time, promoting the all-round development of vocational education can not be underestimated. To greatly and timely promote this cause is one of the Key points in the developments of China's 21st century vocational education.

I. INTRODUCTION

1. Major Adjustments in the Structure of China's Higher Education from 1998-1999

The dual features of high vocational education, talent mode and education scale are the major subjects of how education adapts to economy, social development, esp regional economic development, strengthen comprehensive national power, raise the qualities of laborers, forming a diversified integrated educational structure.

2. Position and Task of High Vocational Technical College in Universities

It is the banner and symbol of educational quality and diploma credit, therefore is an integral part of high vocational educational system: a special arm in promoting quality education and deepening teaching reform. Its function can't be replaced.

3. Vocational Technical College of Zhengzhou University, Past and Present

The college was set up in 1989. It was originally called vocational education centre, mainly engaged in short term vocational training and self study exam guidance. In 1998 it turned to high vocational education. In 1999, it recruited 374 students in 5 specialities in the province.The ratio of registration and admission is 13:1 for liberal arts and 5:1 for science. In December 1999, it changed to Vocational Technical College, a second-rate independent college according to the requirement of State Educational Department.

4. The Statistical Data of Specialities and Students in the University and College

Our school was founded in 1956 and is the only "211 project" school of the Province at present. It occupies an area of more than 1,600 mu. The total area is 350,000m^2. It possesses more than 164 million copies of books, 10 libraries and three laboratories. There are now 8 departments, 43 specialities, 10781 students and 1080 professional teachers. It plans to recruit 4196 students in the year 2000 (3800 undergraduate students, 396 vocational students) Vocational Technical College is one of the seventeenth departments of our university. It has a teaching building of 2553m^2 integrating teaching and training.

II.WORK RETROSPECT

In accordance with the principle of taking reform of educational ideas as the forerunner, educational reform as the core, education facilities construction as the base and management as the impetus, trying to form its own special feature.

1.Change of Concept and the Training of Management Personnel

High vocational education in the modern sense has a history of more than 100 years in China. It had many ups and downs. The reason for this is that the educational theories and ideas are adversely affected by traditional educational ideas and foreign modes. Therefore a new idea on talent, occupation, teaching quality, curriculum, teachers, education management should be formed.

* **Information Exchange**

  Increase the subscription of more than ten kinds of newspapers and periodicals on vocational education, actively symposiums, carrying out inter-school communications.

* **Discussion of Teaching Methods**

  Teachers and staff members routinely hold discussions on the topic of high vocational education, such as the features of vocational education, basic requirements for training and practice, key courses construction, teaching materials construction, management, service and ideological work etc.

* **Expert guide**

  Invite experts, leaders to give academic reports

* **Investigation and research**

  Conduct investigations to **Shanghai** and Shenzhen

* **Training of Management Personnel**

  Carrying out 2 terms of computer management training

* **Adjustment of Management Organizations**

  Establish and strengthen training and management department, job guidance department

2.Specialty Setting up and Courses System

* **The Initiation and Work of the three-in-one Specialized Guiding Committee**

  It is formed by relevant persons in charge of the industries, enterprise personnel, educational specialists. Main functions stipulated in the <regulations>: making educational plans and supervise its implementation, forecasting vocational education development and setting requirements of capability qualities, taking part in the selection of teachers, guiding its training, helping in the verification of job qualification certificates and providing consultancy.

* **Investigation of Social Professions and Forecasting of Industry Development**

* **Preliminary Attempt at Experimental Unit of the Integration of Production, Research and University**

  Through self-raising capitals and loans, set up 3-4 multi-functional laboratories integrating design manufacture and practice.

*** Teaching Plans and Curriculum Design**

Teaching plans of each specialities are consisted are consisted of study period, work ranges, relevant qualification certificates, job capabilities, course type (key courses, vocational technical courses, vocational practical training, etc.), time proportions and implementation details

3. Infrastructure Construction for Training and Study

After ten years of development, the college has possessed basic teaching facilities. In order to open up new prospect of high vocational education and repay society for its trust. It has invested more than 60 thousand in the first half of 1999 and plans to loan 30 million in the construction of infrastructure facilities including:

*** Set up Practical Training Department and Training (Experiment) Centre (3-5 Multi-functional Imitation Training Laboratories)**

*** Promote Multi-media Teaching and Build for Distance Computer Education Facilities**

Meanwhile, give full play to the resource advantage of universities; investigate the resource-sharing mechanism between universities and colleges, between universities and enterprises:

*** Resource-sharing mechanism of the experiment teaching within university**

*** Training base network outside university, including form the inter-university complimentary relationship of teachers, experiments and training between the strong and the weak**

*** Cooperate with government and enterprises in employment guidance**

*** Self-study coach for those on the job and out of school**

*** Short-term Vocational Training Jointly Conducted with, or Entrusted by Government Institutions and Enterprises.**

4.Tasks of Teaching and Learning

*** System of Teacher's Qualification Evaluation, Training and Appointment**

Openly recruit teachers from the university or society. Before start teaching, teachers should study <The Principled suggestions to the Formulation of Teaching plans in high Vocational Education > and relevant documents, drafting teaching plans (including experiment and training plans).

*** Relevant Documents Management**

Experiment report, methods of management of status as a student, teacher's files, etc.

*** Quality Evaluation and Supervision**

Draft <Courses and Teachers Evaluation and Investigation Form>, encourage students to give marks to courses and teachers, routinely conduct examinations about teacher's ideologies and teaching levels, carrying out teaching and research activities.

*** Selection and Compilation of Textbooks:**

Basically using the high vocational textbooks recommended by the Educational Department, other teaching materials will be evaluated by experts.

* **Varied and Colorful Community Activities of the Students:**
  * Emphasize the Education of Political Ideology and Professional Ethics
  * Lay strers on the construction of cultural and scientific facilities, setting up teacher's reference room and student's reading room, preliminarily putting in 2000 to subscribe more than 10 kinds of specialized periodicals and books, setting up a fixed fund to encourage scientific competition activities.
  * Compulsory Labor
  * Scientific, human and English lecture
  * Cultivation of creativity and work capability
  * Part-time work and Part-time study, subsidies for poor students

5. Problem for Discussion

Quality and unique feature is the life line of vocational education. At present these still exist the following dilemmas and problems:

* Covert and extrovert conflict between ideology category facing high vocational education and structural category
* The backwardness of vocational investigation and the lack of guidance in employment prospect forecast and job-hunting
* The proper role of government and enterprises
* The customary practice of mono vocational ethics (moral) education and education reform
* Entrance qualifications and the dilemma of/the "flyover" conception
* The lack of relevant credentials. The application of the qualification certificates of comprehensive and overlapping specialities such as accountant computer calculation, construction supervision and the certifications for English grade test.
* Endless controversies of the teacher's teaching habit and quality standard, subject standard and capability standard
* Discussion of English, Chinese, computer and business lessons
* Development of new curriculum
* Confinable study
* Development of teaching and management manpower resources
* Students' insurance in the training
* Teaching quality appraisal system
* Buildings, equipment and capital

6. Design For The Year 2000-2002

* **Tasks and Environment Analysis:**

Economy, credit; the estimation of the phenomena of "escalation" of diploma by employing units under society, government and university, including Henan's economic development forecast; analysis of the mechanism of mainly relying on tuition and supplemented by government subsidies; society's recognition of diploma population and employment pressure; analysis of government education, personnel, labor policies; research on the adjustment and reform measures of university; analysis of the needs of parents and students

*** Set up 7-8 Key Specialities, the Scheduled Number of Students Will be 1200-1300**

* The selection and initiation of 1-2 high and new technology-intensive and job-elastic choice specialities, determine the development strategies of the specialities and the foundation of the"flyover" according to investigation of labor market
* The experiment unit of integrating production, teaching, training and research-managing capital, solving the problem of lack of understanding between universities and enterprises, planning to set up comprehensive multi-functional training certre
* Realizing the systematic planning of experiment and training, highlighting the feature of vocational education
* Set up 15-20 stable practical training bases
* Establishment of long distance educational network, enlarge inter-collegiate communication and information exchange
* Enlarge capital investment on buildings and equipment through multi-channel efforts
* Set up a teaching team consisted of full time and part-time teachers
* Reform of management mode and system, improve the system of appointing, training teachers as well as the tutorial, evaluation and personnel check-up system, explore the ways of elective course and the credit system
* Reform of the existing curriculum and reorganization of the curriculum system as well as curriculum appraisal-explore the content and modes of quality education, continuable education, conducting research on the lessons of Marxism's-theories, DengXiaoPing's theories, physical training, culture and arts, labor for public good, vocational ethics (moral) lesson as well as selective curriculum of arts and science covert curriculum.
* "Elevate" 1-2 four-year schooling high vocational undergraduate specialities, making academic and talent preparations for the application of master's degree station.
* Strengthen teaching and scientific research, accomplish 2-3 large and medium-sized academic tasks entrusted by the government or by cooperating with enterprises, trying to get research funds
* Gradually compile textbooks of the college itself, actively taking part in the national, provincial and municipal compilation of teaching materials
* Explore students' activities of mass organization mainly for skills competition and management service activities centering on labor insurance.
* To appeal for the establishment of a provincial and regional labor market analysis system and a community technical training certre
*Conduct multi-level before job, after job vocational training and self study exam guidance

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TEACHING STATISTICAL PROBLEM SOLVING IN VOCATIONAL EDUCATION

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Index: Vocational education, problem solving and statistical practitioner.

Abstract: As our society is moving towards information economy, vocational education programs should equip students with the skill able to search, use and analyse information. Although the rapid and continuous development of information technology can ease the computational burden of data analysis, statistical analysis of data is not a simple task that acquires statistical practitioners having specific knowledge and skills to deal with statistical problems.

Education of statistical practitioners is specifically concerned with preparation for improving performance in applications of statistics in industries such as finance, manufacturing, etc.. This advocates learning problem solving skills which require practice in thinking about, implementing and evaluating solutions to statistical problems. In this paper, the author wants to discuss the roles of vocational education in education and society; and to explore how to educate statistical practitioners to solve statistical problems in real-life projects.

INTRODUCTION

Many jobs today require labour with formal training and preparation for initial job entry. One of the fundamental purposes of vocational education is to provide each student with competent skills for employment. These skills should meet the needs of the local labour market and the competency standards accepted by industry (Hall, 1991).

Improving problem solving performance at work is an important aim for vocational education. Thus, the vocational curriculum focuses on a practical approach rather than a theoretical approach. Their learning activities usually include tutorials, laboratory and workshop practice sessions in addition to lectures. The students learn how to use tools and practical techniques to perform tasks; and how to solve problems in work environment effectively (Nasta, 1994).

As our society is moving towards information economy, information literacy becomes an essential skill mandatory of today's work as well as living. Hence, vocational education programs should equip students with the skill able to search, use and analyse information. Although the rapid and continuous development of information technology can ease the computational burden of data analysis, simply using information technology as an analytic tool without genuine statistical understanding of data may lead to inaccurate results and/or invalid conclusions. As a matter of fact, analysis of massive amounts of data is not a simple task that acquires statistical practitioners having specific knowledge and skills to deal with statistical problems.

Statistical practitioners provide statistical support and services to various government departments as well as industries such as, finance, manufacturing and so on. For instance, they can provide financial analysts with expected returns and statistical measures of variability of returns in their investment portfolios. Education of statistical practitioners is specifically concerned with preparation for problem solving performance at statistical works. They are encouraged to play an active role of learning rather than the role of passive recipients of teaching. This advocates learning problem

solving skills which require practice in thinking about, implementing and evaluating solutions to statistical problems. In this paper, the author wants to discuss the roles of vocational education in education and society; and to explore how to educate statistical practitioners to solve statistical problems in real-life projects.

THE ROLE OF VOCATIONAL EDUCATION IN EDUCATION

The primary purposes of vocational education are pre-employment training, retraining for new or different jobs or upgrading the skills of a workforce. Each person can have access to advance to his or her highest potential consistent with his or her ability, interest and desire and the needs of society.

A vocational education college needs to promote links and liaison between vocational education and the employers in industry. The co-operation between the college and the employers should be maintained in a well-informed level. If the employers want their future employees with certain specific skills in order to cope with job requirements in our technological society, there should be a channel to communicate with the college. Thus, the college can ensure that training or future education program meets the needs of the local labour market (Hall, 1991).

Vocational educational helps students develop attitudes about the personal, social, psychological and economic significance of work. They are taught attitudes conducive to workplace discipline. They should be made aware of their roles in the world of work. They learn how to relate to characteristics of economic activity with their careers or jobs. Curriculum planning for vocational education can be based on the nature of society (Olson, 1973).

The education process should involve the students actively rather than allocating them the role of passive recipients of teaching. Learning should be directly relevant to the active interests and concern which students will face in their out-of-school life. This implies a progressive increase in student control and autonomy.

The vocational curriculum usually has an emphasis on a practical approach and includes laboratory work and workshop practice. The students learn to use tools and practical techniques to perform tasks in a field of occupations. Vocational curriculum is planned to recognize the fact that skills and related technical knowledge vary in content and depth for each job requirement. Therefore, all students after completing their vocational education are able to work effectively (Nasta, 1994).

THE ROLE OF VOCATIONAL EDUCATION IN SOCIETY

Our technological society expects that everyone can have the opportunity to earn and enjoy a good living. For instance, people enjoy advanced technologies in communication such as, mobile telephone, facsimile machine, personal computer, satellite television and so on. In our technological society, vocational education are able to:- improve and promote economic, social and intellectual growth; make contribution to a nation's asset; promote career awareness and prepare youth for employment (Shoemaker, 1971).

Secondary school output has in recent years grown much faster than employment opportunity. Government, therefore, needs to handle the problems of slow growth and youth unemployment. Theoretically speaking, the problems can be remedied by vocational education because it serves to adjust the rate of youth unemployment in labour market. Lower rate of youth unemployment will be found if more youth are engaged in full-time vocational education. Hence, vocational education programs are designed to prepare youth for an entry-level occupation (Organisation for Economic Co-operation & Development, 1983).

As the society with more people with higher skill levels, human resources become the product of vocational education. It is to provide practical help to employers wishing to improve their training efforts; deliver and develop training system in local industry. This improves competencies and abilities of employees. In this way, employers can improve their productivity and the quality of products they manufacture. As a consequence, this may improve their enterprise. Thus, vocational education makes contribution to a company's asset as well as a nation's asset in general.

STATISTICAL PROBLEM SOLVING

Many vocational education programs aim at teaching students how to solve problems in workplace. This is a practical and efficient learning approach when the students are placed in a problem situation (Gagne, 1985). Problem solving is another form of learning because students have also learned something new after completing their problem solving tasks (Tolman, 1959). It requires the students to discover the higher-order rule with minimum assistance.

Education of statistical practitioners in vocational education level is specifically concerned with preparation for improving performance in applications of statistics in industries such as finance, manufacturing, etc.. Thus, a statistics curriculum should be built around problem solving skills so that statistics learners will be more easily to transfer their skills from learning environment to work environment. Practice in solving statistical problems is helpful in producing competent statistical practitioners because such practice is able to:- enhance the learning process; reinforce statistical concepts and techniques; provide an environment of construction participation; and improve statistical thinking and reasoning. Helping students master the problem solving skills is an instructional objective.

Problem solving involves a set of events in which students use previously learned rules to achieve a goal. The acquisition of previously learned rules is essential but not sufficient (Francis, 1990). Problem solving requires intellectual skills, organised verbal information and cognitive strategies. Intellectual skills refer to the rules, principles, and concepts that are required for operations. Organised verbal information helps problem solvers understand the problem and carry out a validation of the answer. Cognitive strategies enable the student to select appropriate information and skills and to decide when and how to apply them in attempting to solve the problem (Gagne, 1985).

To discuss the statistical problem solving process, the following example based on the topic of regression analysis is presented. Regression Analysis is one common technique employed to solve statistical problems. Its concepts were taught in lecture session and computer laboratory sessions gave students hand-on practice experience. On completion of this topic, students were expected to build up a regression model that could be used for prediction. Without solving problems on their own, they were unable to have an overview of statistical problem solving process. Therefore, their teacher (i.e., the author of this paper) asked each of his students to do a mini research project that was data-driven and problem-oriented. Each project was completed on individual basis under their teacher's supervision. In this way, each student took more active role in his or her own learning and was less reliant on his or her teacher. Each student was required to:- 1) propose his or her own project title; 2) identify the aim of the project; 3) set the research objectives; 4) collect the relevant data; 5) analyse the data by using the regression technique; 6) do statistical computations by using SAS (Statistical Analysis System) software; and 7) submit a written report on his or her own research findings.

Students would be active to participate in topics that interest them when they could identify their own topics. For example, one student could propose "Analysis of Electricity Consumption in Hong Kong" as the topic. Each of their project titles was required their teacher's approval in order to avoid

duplication of project title and/or work.

In attempting to solve a problem, problem understanding is prerequisite because crucial to successful problem solving is the organised verbal information employed to translate verbal statements into specific directions for statistical operations (Francis, 1990). This guides a problem solver to construct his or her own representation of the problem so as to achieve the goal of the problem. So that, students had to put down a problem statement that outlined the aim of the problem. They should also clearly state the objectives of their project to be achieved.

Although the problem statement and the objectives provided clues associated with previously learned rules and strategic planning of problem finding, students could hardly complete their problem solving tasks in their projects, without having some guidelines of model building. For this reason, the strategy for building a regression model given by Neter et al. (1996) was discussed in lecture and computer practice sessions. The strategy requires regression modellers to:- 1) compile data; 2) check four assumptions: correct functional form, homoscedasticity, independence and normality; 3) check multicollinearity; 4) detect outlying and influential observations; 5) build a tentative model based on five model selection criteria and three model selection procedures; and 6) check model validity.

For manageable workload for collection and processing of data, each of the students had to compile a set of real data containing one dependent variable, five independent variables and eighty observations. They were asked to collect real data because the context of real data kept them actively participated in the statistical problem solving process (Cobb, 1987). In order to keep their eyes focused on problem solving tasks, they could use the data compiled and released by Census and Statistics Department of Hong Kong Special Administrative Region. Students were required to prepare and submit their own data set together with a report describing the data context to their teacher. He then checked whether or not the nature of data was consistent with context of the topic. If consistent, an approval was granted. Selection of relevant data required students' cognitive strategies to justify whether or not the data could be used to achieve the stated objectives.

Before a regression model was built, students had to check four assumptions and the existence of multicollinearity, outlying and influential observations. What students acquired were intellectual skills to check all these. They basically carried out statistical tests to determine whether any of the four assumptions was violated or not; multicollinearity existed or not; and outlying observations or influential observations were detected or not. If any of the statistical tests failed, remedial work should be done. How the remedial work to be done was an important issue. For instance, the linearity assumption was violated, how the data to be transformed was a key question. To answer this question, the employment of a cognitive strategy was to guide student's thinking in finding which parts of the data did not achieve linearity; whether a specific form or pattern of data was recognised; and what form or pattern of the data appeared to be. All of these suggested what data transformation the students should try. Successful data transformation relied on cognitive strategy of a problem solver as well as the nature of data.

To save tedious and laborious computations in data analysis, students made use of SAS software to build the best regression model. Forward Selection, Backward Elimination and Stepwise Regression were the three rule-based model selection procedures. The acquired intellectual skills were to justify the significance levels of entry and removal. Then, SAS would take care of the rest of the procedures and came up with a final regression model. These three procedures were not necessarily to provide the best model but they could serve as screening procedures especially for a large set of data. Using five model selection criteria: $\overline{R}^2$; s^2 ; the length of the prediction interval; C statistic; and PRESS acquired students to possess intellectual skills and cognitive strategies to build the best regression model. Although selection of the best model relying on each individual criterion was stated, strictly using these criteria might come up with many probable models. Consequently, no regression model was built. For the situation like this, students should study how each of the selection criteria might

affect the importance of an independent variable. They should employ their cognitive strategies to justify the practicality and the usefulness of the model when the model was built on their own. This also took parameter estimation and parsimony into consideration. They should keep their eyes and minds open to the computer output as the modelling process is dynamic. Through model building, they could eventually develop critical thinking and evaluative skills that would allow them to have success in the workplace.

For successful problem solving, the problem solver must find ways of checking or validating the answer (Gagne, 1985). This procedure is important because problem solvers should assure correct answer. Similarly, model validation is a mandatory part of the model building process (Neter et al., 1996). So that, the students should check up on the model in the sense of plausibility and usability of the regression model. In carrying out model validation, organised verbal information enabled students to perform residual analysis for overall model fitting.

The whole process of problem solving was incomplete not until writing a report. Writing statistical report is one of the job duties of a statistical practitioner so as to communicate analytical results to non-technical audience in a clear and concise manner. In addition, report writing is able to focus on the internalisation and conceptualisation of subject material; encourage creativity; and enhance the ability of communication (Radke-Sharpe, 1991). The students therefore were required to submit their reports because report writing was a part of statistical training.

CONCLUSION

Improving problem solving performance at statistical works is essential in an information age because analysis of massive amounts of data acquires statistical practitioners having specific knowledge and skills to deal with statistical problems. Teachers of statistics must differentiate problem solving from the routine statistical computations. That is, students should not be taught only to use previously learned rules carrying out routine tasks to solve problems but also knowledge and strategies in problem solving. This requires students competence in intellectual skills, organised verbal information and cognitive strategies.

Genuine statistical problem solving takes into account and deals with problem understanding; the translations of problem settings into statistical operations; evaluation/validation of the results; and dissemination of the results. The learning of problem solving best occurs when students are assigned to solve their own problems. They are more interested in completing their projects when the projects are arising out of application to real-life problems. The teacher's task is to organise appropriate problem solving situations and to ensure the scope of problem is within his students' capabilities. The students should maintain strategies effective in solving a problem. Their teacher acts a supervisor to assist students in clarifying and then confirming or disconfirming their working steps.

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STRUCTURE AND CULTIVATION OF THE KNOWLEDGE AND ABILITIES OF STUDENTS OF HIGHER VOCATIONAL TECHNICAL EDUCATION

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Index: Higher vocational education, Knowledge, Ability, Cultivation

Abstract: This paper puts forward the constitution module for the knowledge and ability structure that students of higher vocational education should have. It sets forth at the full some basic principles that the basic knowledge the students of higher vocational education should master ought to be limited to no more than enough for their future use while their special skills and knowledge should be advanced, practical and their humane knowledge should be rich and extensive. It also suggests certain measures for the cultivation of their comprehensive practical abilities and the dialectical relationship between knowledge and ability which leads to the conclusion that equal stress should be put on both of them.

A. An Account of Our Raising the Question

With the development of national economy and society, the wide application of high and new technology, the rapid development of the third industry, and the breaking-up and compounding of the original vocational posts, a lot of hi-tech-related vocational posts have been created, the technical content and intelligence level of which are becoming higher and higher, as a result of which society has raised even higher requirements of those to be employed in both their knowledge and abilities. In such a case, the technical talent from secondary vocational schools is no longer able to meet the requirements and qualified for the posts. On the other hand, the talent cultivated by institutions of higher learning, which have long been pursuing the subject-centred cultivation module, is neither able to adapt himself to the front-line requirements of production, construction, service and management. As a result, great efforts must be made to develop the higher vocational education so as to turn out various talent able to meet the requirements at different levels. The higher vocational education in our country started its life in 1985, and the Vocational Education Law formally went into effect in September 1996, since which time the higher vocational education has established its legal place. The three-reforms-and-one-compensation policy suggested by the National Education Ministry to boom the higher vocational education began to be tried in more than 20 provinces and municipalities in 1998, when 110,000 students were enrolled.

And universities and colleges of undergraduate course in our country also began launch pilot projects in higher vocational education from 1999. As far as the speciality offering, teaching plan making, coursebook selecting, and the practice of teaching plans are concerned, however, they are all still in the experimental phase of being studied, practised , reformed and established. Up to now, a perfect cultivation module has not yet been formed.

In order to adapt to the requirements of the knowledge-economic age and the information society, the present paper of ours suggests a constitution module for the knowledge structure of the students of higher vocational education, and some cultivating approaches and measures to intensify the cultivation of their creative and practical abilities, so as to promote the rapid development of science and technology and economic construction in our country.

B. The composition of the Knowledge-and-Ability Structure of Students of Higher Vocational Education

Knowledge is a general term which is used to refer to the understanding and experiences of man gained in the practice of his transforming the objective world, and which has been organized and classified into various subjects, while the ability refers to man's comprehensive application of his knowledge, which is the subjective conditions enabling man to be equal to his work. The study of the science of talent has proven that knowledge is the basis of one's ability, while one's ability is the representation of his knowledge. Only when one has a good and systematic command of much knowledge, can he develop and heighten his ability. On the contrary, without knowledge, the cultivation of one's ability would come to nothing. Therefore, to develop one's ability, he must first acquire sufficient knowledge. On the other hand, however the accumulation of one's knowledge does not necessarily mean the natural improvement of one's ability, that is, one's knowledge is not equal to his ability. Just as the old saying goes, pedants may gain high scores but show low abilities. Thus, school education should aim at not only teaching students much knowledge but also leading and driving students to turn their knowledge into abilities in the course of learning their knowledge, which are of even greater importance. And the improvement of their abilities will, in turn, provide the necessary conditions to facilitate their acquiring new knowledge and expanding their knowledge range. From the above-mentioned, it is not difficult to see that knowledge and ability are inseparably interconnected and complementary to each other, and can reinforce each other. They are different from each other but related to each other. Neither of them can replace the other. Thus it can be concluded that higher vocational education in our country should be geared to the needs of the modernization construction, the world and the future, based on which the necessary basic knowledge to be taught to the students should be limited to no more than is required while their special skills and knowledge should be advanced and practical and their humane knowledge should be rich and extensive, all of which make up the basic principles for the cultivation of the technical application abilities of the students of higher vocational education, upon which, the design of the students' quality structure in knowledge and ability, and their cultivation plans should be based. In our opinion, the students of higher vocational education should be equipped with four kinds of knowledge and six abilities.

The four kinds of knowledge should include: 1. factual knowledge which tells people "what it is"; 2. principle knowledge which tells people "why"; 3. skill knowledge which tells people "how" such as techniques, skills, methods and keys; and 4. manpower knowledge which tells about who will be involved and whom to cooperate with, and which actually refers to the knowledge and ability of administration.

The five abilities refer to 1. the creative ability; 2. the thinking ability which means the ability to turn out new ideas, to find out and solve problems and to think about and analyse problems according to various symbols and images; 3. the ability to acquire and make use of knowledge and information; 4. the ability to make rational use of and dominate various resources such as time, expenses, equipment, manpower, etc. 5. the ability to properly deal with interpersonal relationships, which will enable them to efficiently cooperate with others, and work together with people of different backgrounds; and 6. the ability to learn all one's life.

C. Reorganizing the Teaching and Learning Structure and Optimizing the Teaching Plan

Teaching plans are blueprints for the cultivation of students, which have to focus their attention on the requirements of the development of social economy and the developing trend of

the specific pecial fields, and which will enable the students to occupy a proper position in the labour market with their stored knowledge and learned skills. Owing to that, the relationship between basic theory and professional knowledge has to be properly dealt with when the course structure is reorganized. Greater stress should be put on the proper orientation for the cultivation of talent and his application abilities. What's more, the students should also be equipped with proper sustainable developing abilities, fine vocational morality and devotion spirit.

When forming the course framework for higher vocational education, we must try our best to stick to the right orientation, emphasize practice, show the comprehensive features and gear it to the future.

(1) We must firmly stick to the socialist orientation. When teaching the "two courses", we must put greater stress on combining theory with practice so as to improve their practicality and efficiency. A good job must be done of the political and ideological education and the specialized education must be combined with the ideological education. In the course of specialized education, a good job must also be done of their specialized spiritual and moral education.

(2) Great stress must be put on practice. The practice time for each speciality at school must be normalized. It must be ensured that half of their three-year studies at school must be spent on practice, experimentation, social investigations etc. , which will be arranged for them by school. In the meantime, the course practice scope must also be expanded, with part of the teaching content of the basic courses for specialized courses taught in the lab, and part of it taught at the site so as to intensify their perceptual knowledge and help them form a positive professional orientation. As far English teaching is concerned, the training of their listening and oral expression abilities must be strengthened. As for their computer knowledge and application competence, they will be required to pass the national computer grade tests.

(3) All the courses must be synthesized. Because the higher vocational education aims chiefly at the cultivation of the technical application talent, the synthesization of different courses are of even greater importance. The synthesization should be performed at two levels: one is reflected in the specialized courses, which means establishing the specialized course module centering around special skills. In the specialized module, most of the courses will be short-period ones, with the long-period courses strictly limited, the timely tests made of the efficiency of the courses being taught and the training requirements in the specialized module made clear, so as to achieve the interacting effects of the skill training and knowledge teaching. The other is reflected in the common courses, which means establishing the course module centering around quality education and intensifying both ideological and specialized education, both of which aim at combining humane education with science education, theory teaching with practice teaching, and basic education with advanced education.

(4) Put into practice the policy of the "three orientations" ,and develop the students' quality in an all-round way. At present, special stress should be put on the improvement of the students' future-oriented quality. To realize this objective, we must pay attention to three respects: the first one is to strengthen their study of foreign languages by combining foreign languages learning with their vocational requirements, with great stress placed on the cultivation of their foreign language application ability related to their future work; the second one is to intensify the teaching of basic computer knowledge. In the future society, no members, if they don't know how to operate and use computers and develop computer software, can bear important responsibilities for social

development; the third one is to expand the psychological teaching content. The pressure brought about by competition in the future society will be a new problem man has to face, in which case the adaptability of the students to society and their life must be strengthened. The teaching module for the three-year vocational education in our institute is shown below:

The proportion between theory teaching and practice teaching will be 1:0.8. Among the theory teaching part, the two-course education module will take up 9.4%; foreign languages teaching module 12.2%; physical culture module 4.9%;cultural quality module 4.2%; computer module 6.6%; natural sciences module 10.7%; basic courses module for specialized courses 27.56%; specialized courses module 24.6%. With practice teaching, basic experiment module will take up 8%;specialized basic experiment module 14.5%; specialized experiment module 18.5%;the concentrated practice links 59%.

The operation of the teaching plans for higher vocational education has its own characteristics, owing to which three synchronizations must be stuck to in the course of making course plans. Firstly, the adjustment of the course plan must be synchronized with the deepening of people's ideological understanding. Secondly, the adjustment of the course plan must be synchronized with the deepening of teaching reform. And thirdly, the adjustment of the teaching plan must be synchronized with the improvement of teachers' qualities.

D. Strengthening the Cultivation of Their Practical Abilities

The most important feature of higher vocational education lies in the cultivation of students' better practical abilities. However, how can we turn out talent with both comparatively better practical abilities and outstanding knowledge-creating abilities to meet the requirements called for by the knowledge-economic times? We think the study and reform of the following links should be emphasized and intensified.

1. Turning verification into application in the course of practice teaching

With the cultivation objective of higher vocational education taken into account, we should ,when leading students in doing experiments, turn verifying experiments into application experiments according to the specific characteristics of the students, which means the students should be made not only to skillfully master the methods and skills of a certain experiment but also to know what else the experiment can do and how to make use of it. In this way, the students' view will be widened, their creative inspiration will be activated, and their knowledge-creating sense and creative thinking will be developed. For example, in the viscosity experiment of lubricating oil when the verifying method was adopted as the experimental method, students used to be asked to verify the result through experiments after they had been given the standard oil and informed of its viscosity value. However, if we reform the experimental method by changing the standard oil into used oil, and asking the students to find out the viscosity value of the used oil for themselves in the same experimental conditions, to determine the quality of the lubricating oil according to the change of its viscosity values, and further to decide whether the lubricating oil can be used any longer, what will the students learn from the experiment? From it, they will actually know how to gain accurate and reliable data for their use and management of oil for mechanical equipment according to their own analysis of its physical and chemical targets. This kind of experiment can also enable them to analyse the causes of the lowering in the quality of the oil, and find out the specific spots which cause the lowering so as to provide a scientific basis for the trouble -shooting and maintenance of machines.

2. Turning visiting into exchanging in the cognitive practice

The cognitive practice is an important and integral part of practice teaching links, which aims at making the students realize the objective world through the reflection of their brain on the objective world, and which belongs to the perceptual stage of cognition. This stage aims at involving the students in their vocational fields as early as possible so as to strengthen their interest in learning their specialized courses and awaken their knowledge-seeking desire, which will surely help them change from passive receiving of knowledge to active gaining of knowledge.

Generally speaking, the process of the cognitive practice used to be nothing but a superficial-understanding-gaining visiting process. To change this situation, the guidance teacher has to go to society, make wide investigations and work out scientific and rational practice outlines when selecting practice units. Detailed plans should be carefully made to invite technical leaders and experts to give reports on special topics, who will introduce to the students their important work posts and the making links of their typical workpieces. During the reports, the students and their masters should be give sufficient time to discuss and exchange their ideas so as to make the students able to know the all-round requirements of the key posts on the talent in knowledge, skills and quality. Thus, the ability of the students to find out and gain knowledge in practice will be actively developed.

3. Turning the passiveness into mutual compensation in production practice

The production practice will be performed in this way: students will play the main role, their masters will work as the main guides and their teacher will serve as the bridge between the students and their masters. The masters are rich in practical experience and operation skills but short of theoretical knowledge and lateral exchange of information, in which case some of their key processes or methods may be out of date. However, on the contrary, their weak points may be just the strong points of their students and the new processes, methods and techniques needed by their key technology might be the ones the teacher is good at. If a good job is done of the coordination by the teacher in a rational way, the effect of mutual benefit may be gained. Let's take for example the production practice in machinery repairs. When fixing the cylinder jacket of the internal combustion engine the masters usually still use the traditional fixing method, which means that they will first put wooden blocks under the end of the air cylinder and then strike with a hammer. This kind of traditional fixing method will result in poor fixing quality, owing to which the method was dropped off long ago from the new modern internal combustion engine repair processes and replaced by a new fixing process, in which the surface of the cylinder jacket will be coated with machine oil after the water-proof ring is fixed, and then it will be pushed in place manually. The new fixing process can ensure good fixing quality and also save much time and labour.

4. Changing from one certificate to more certificates in the certification system. Our higher vocational education will put into practice the multi-certificate system, which means the students will be required to take part in various vocational skill tests and appraisals according to the various vocational skill norms specified by the labour or social security sectors concerned, about which we have made clear and detailed specifications in our teaching plans, and as a result of which the students will be able to get their corresponding vocational qualifications certificates as well as schooling certificates at their graduation.

All the courses and teaching content will be normalized according to the national unified vocational skill standards and the vocational skill appriaising specifications. Both teaching and learning will be organized according to the requirements respectively related to basic skills, specialized skills and relevant skills. The students will be required to have a good command of at

least a foreign language and the operation of computers and other modern office equipment, and to be equipped with their corresponding vocational abilities so as to lay a fine foundation for their successfully gaining their "employment passes". To realize this objective, we have actively created the necessary conditions for them, by which we mean that our institute has already had a vocational skill appraisal institute, one of the national computer grade test points and a driver training centre established in our institute, our applications for all of which have already been approved by the Provincial Labor and Social Security Departments and the Test Centre of the National Education Ministry. Now, we have been authorized to test and appraise the vocational skills for 8 posts such as engineering survey, architectural decoration, and computer grade tests, as a result of which part of our students will be able to get their driving licenses and other certificates at their graduation, which will surely facilitate their employment after their graduation.

Practice teaching is the life-line of the higher vocational education and the key to the cultivation of students' comprehensive abilities and qualities. Facing the challenge of the knowledge economy of the 21st century, we must be clear about the developing situation, firmly grasp the opportunities, intensify the practice teaching links, and strengthen the engineering practice training so as to lay a solid foundation for the rapid development of the knowledge economy in our country.

As a type of higher education, the higher vocational education started its life quite late in our country. As a result, we have only made some primary study of and a basic exploration into what kind of knowledge and abilities our students should be equipped with, and how their practical abilities can be strengthened and their creative spirit can be developed. We have just built up some of our own features in school-running modules, which are no doubt far from perfect, and still leave much to be desired. We sincerely hope to share our experience with our broad colleagues and we are determined to make even greater efforts to search for an efficient way for the rapid development of the higher vocational education in our country.

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TELLING STORIES IN THE USE OF PORTFOLIO ASSESSMENT IN HIGHER EDUCATION: SOME IMPLEMENTATION ISSUES

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Index: Assessment, Portfolio

Abstract: Evidence has shown that the results of traditional standardized tests characterized by pencil and paper formats, multiple-choice responses and time-restricted completion are not sufficient in telling how pupils engage in the learning process and their progress in learning. In addition, these tests tend to emphasize on the assessment of basic skills but fail to measure higher level thinking and problem solving skills. This inadequacy can be addressed by incorporating authentic assessment approaches such as performance tasks, portfolios, and grading for team effort. This paper aims to tell stories from an action learning research group whose members have used 'portfolio' as an alternative assessment strategy in higher education.

TRENDS IN ASSESSMENT

The term assessment usually refers to the full range of information gathered and compiled by teachers about their students and sometimes their classrooms (Freeman & Lewis, 1998). Information on students and learning are formally collected through tests, examinations and continuous assessment; and informally through observation and verbal exchange. On the other hand, information about the classroom and teaching obtained from informal student feedback and formal course evaluation can also form part of the assessment.

Since early 1990's, a number of educators have focused their assessment and evaluation efforts on lessening the misuses of standard tests, improving existing tests, and most importantly, developing alternative means of assessment including portfolio. The focus of assessment has shifted from the measurement approach to an evidential one (Freeman & Lewis, 1998). While the measurement approach stems from psychology and science, the evidential approach is rooted in sociological and legal models. The evidential approach does not claim absolute objectivity, but seeks to draw justifiable conclusions from evidence drawn from a range of different sources. The student often plays a key role in deciding what should be offered as evidence. Portfolios are usually the means for presenting the evidence, and can even be used as a reporting device.'

PORTFOLIO ASSESSMENT: CONCEPT AND CHARACTERISTICS

Portfolio' embodies a number of key features including:

- Students are directly involved in assessment, working proactively including provision of

evidence.

- Teachers are no longer the sole marker or assessor. Self and peer evaluation form part of the assessment process. The role of teachers becomes multifaceted.
- Assessment moves from mainly summative and norm-referenced to continuous and criterion-referenced.
- Assessment arrangements are more flexible, for example, in time, method and location.
- Reporting of assessment results is more complex, employing methods like profile and portfolio.

Portfolio assessment is closely related to performance and authentic assessment. Instead of having students respond to paper-and-pencil tests, performance assessment whose emphasis is on procedural knowledge acquisition, requires students to demonstrate that they can perform particular tasks. However, authentic assessment takes this a step further by stipulating that a real-life setting in these demonstrations.

Portfolio assessment involves students gathering evidence on an on-going basis from multiple indicators of progress to demonstrate achievements over time that meet course goals. In this sense, portfolios are both descriptive and evaluative in nature as they provide tangible products in the form of a folder, a notebook, or a box that document students' effort and intangibly an insight into students' learning process and their ability to perform particular tasks. Portfolio assessment therefore includes both process and product. The process involves students and teachers working collaboratively to create a portfolio that will be both multidimensional and dynamic. Through both process and product, students' learning and growth can be assessed.

The process of portfolio development includes four distinctive aspects: reflection, negotiated portfolio planning, conferences, assessment and evaluation.

Reflection, a key element of portfolio assessment, requires students to make judgements about the adequacy and effectiveness of their own knowledge, performance, beliefs, or effects for the purpose of self-improvement. Reflective processes help us conceptualize and formulate our rules and principles based on which we build our knowledge, personal theories and judgement. Through thinking and re-thinking systematically, experiences become more valuable. However, students need to understand reflectivity, see its value, and learn how to reflect logically and methodologically aspects of their experience (King & Kitchener, 1994; McLaughlin, 1995).

Negotiated portfolio planning can be seen as part of the process of curriculum enactment, which can be viewed as the educational experiences jointly, shaped by student and teacher. Underlying this perspective, knowledge is individualized. It is also a personal developmental process, both for the student and the teacher. From my personal experience, active student involvement in the planning stage significantly increases the sense of responsibility and ownership. Students feel that they can perform reasonably well as expectations are clear and the portfolios truly represent their effort and demonstrate their ability.

The success of the portfolio process relies largely on the mutual understanding between the student and the tutor developed through formal and informal conferences. We argue strongly that time spent on actively interact, negotiate meaning, and clarify terminology with students is time well spent and should be invested wisely. Thus conferences should focus on examining aspects of the portfolio process that are of particular concern to the student, exploring the development of certain pieces of evidence, or assuring possible anxiety.

Implicit in the use of portfolios is the assumption that each student's work is highly personalized and idiosyncratic. Because of these inherent differences among students, evaluation can be extremely challenging. Evaluation is distinguished form of assessment. Evaluation embraces the judgement and decisions, and can be either conducted by self or peer or both. Portfolio assessment is formative and criterion-referenced. The courses of action including planning, writing rational statements and objectives, gathering evidence, sharing and presenting are integral parts of the assessment and evaluation process.

Rubrics or descriptors of performance are used to facilitate the alignment of portfolios with the reporting process. They are the scoring criteria and represent a continuum of performance, and they give a common ground for discussing the portfolio development process and the product.

SOME ISSUES ON IMPLEMENTATION

The concept and characteristics of "portfolio assessment" puts forward two main arguments for its adoption – it is a student-centered approach, and it has positive implications for teaching and learning (Clemmons et al, 1993; Kemp & Toperoff, 1998; Paulson, Paulson, & Meyer, 1991).

The teacher/school perspective However, it is anticipated that the road toward "portfolio assessment" will not be a smooth one. The use of "portfolio" will create "additional demands on teachers and students as well as on school resources." (Sweet, 1993) A major concern involves finding time for the regular student-teacher meetings and to effectively assess student portfolios, particularly when the class size is large (Farr & Tone, 1994). Furthermore, the lack of resources, such as a room for meeting; a place to store student portfolios; and the availability of audio-visual equipment to collect evidence, could seriously dampen any enthusiasm to implement portfolio assessment.

In the development stage, there is a need to (1) identify competencies to be assessed in student portfolios that matches the learning objectives of the module; (2) select the learning activities that will work well together; and (3) make some decisions on possible portfolio evidence and assessment mechanisms.

It is understandable that not every teacher will embrace the concept of "portfolio assessment" with equal zest. Teachers need to familiarize themselves with the concept and be convinced of its value before they are willing make a commitment toward its implementation.

Teachers involved in using portfolio need to periodically meet and share their experience on using this concept among themselves. Nationally and internationally, they should continue to learn more about "portfolio assessment" by attending relevant seminars, workshops, and conferences on the use of portfolios. Likewise, students need instruction on how to carry out work that is required in assembling a portfolio.

The student perspective In this aspect, four major areas of concern in implementation deserve special attention: student anxiety in conducting reflection and self-analysis; student workload; student-tutor relationship; and effectiveness of portfolio conversations.

Student anxiety in conducting reflection and self-analysis is understandable because of their inexperience and inadequacy in recalling and expressing their thoughts. To improve on this situation, it is for students to learn about thinking skills and practise how to reflect systematically.

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One of the pitfalls in portfolio development is the underestimation of student workload both by the tutors and students themselves. Overloading resulted from time under-allocation and over-involvement cannot be ignored. A related problem is the individual variation in the time spent on portfolio development. It varies significantly from the enthusiastic and committed students to those who "put a few things together" for submission. Tutors should provide appropriate guidance in helping students to manage time realistically and appropriately and techniques such as scheduling will assist students in completing identified tasks promptly.

One key asset of portfolios is that they provide a vehicle for student and tutor collaboration particularly on assessment. During the process of portfolio development and assessment, the tutor and students need to negotiate between themselves on who decides on what goes into the portfolio; how the materials will be analyzed; when it will be analyzed; and how information will be shared.

Since portfolio assessment deviates significantly from common practices when assessment is something done *to* student rather than done *with* students, effective two-way communication is the key to success in the tutor-student relationship. Take the ongoing setting of goals based on the students' reflections of their past efforts as an example, both tutors and students have expressed mutual doubts on the efficiency and effectiveness of portfolio conferences or dialogues. These dialogues are considered as time-consuming and unproductive. Thus it is apparent that effective skills in facilitating portfolio conferences have to be learned. In this connection, meeting management strategies such as having an agenda; reading materials before meetings; keeping the sessions on tasks and on time; reviewing and recording decisions made; and setting tasks for the next session will be useful.

OUR OWN REFLECTIVE LEARNING ON THE USE OF PORTFOLIO THROUGH DIALOGUE

Assessment is a core element of causing quality in higher education if it stresses on improvement. While the general trend in assessment can be seen as taking shift from the measurement approach to evidential approach (Freeman & Lewis, 1998), there is also suggestion that learning in higher education should move from the institutional controlled model to a learner development model. Students in higher education should be given the responsibility of their own learning and the related assessment.

"Since we are using 'portfolio assessment' for the first time, the teachers involved in this endeavor need to periodically meet and share their experience on using this concept among themselves. Feedback collected from asking each other critical questions of our own practice will help us to grow professionally."

"I was also learning more about them as learners and as people – that being bonus."

"Over the last 5 years this strategy has helped me bring about a change in student learning related to their attitudes toward learning making them more reflective, more empowered and at the same time improving their English communication skills as they are native Chinese speaking students."

"My task is to focus on how I used it in my classes to change the way the students began to think about themselves and their learning and as a result how I began to learn more about them as learners and as individuals … as they began to learn more, much more …"

"I found that students have developed a greater understanding of their specific learning style when they self-evaluate and reflect on the evidence they have selected for inclusion in the portfolio … they have learned to use a wider variety of learning styles …"

"... I feel that my students are doing what the research on portfolio says they will do: they can think more reflectively about themselves and their learning; they think about continuously improving their skills; they feel in charge of their own learning; they like working in teams; and they write better in English."

"Nonetheless, we have to explore and try out a different kind of relationship with our students, and I discover that a strong sense of trust is required."

CONCLUSION

From the above extract of dialogue, professional understanding and insights were gained in the conceptualization and implementation of portfolio assessment in higher education settings. Four key aspects emerged from this learning experience. First, the belief that portfolio assessment could enhance teaching and learning was confirmed. Second, using an alternative assessment strategy was innovative requiring re-conceptualization of the nature of learning and changes in beliefs, attitude and practice. Third, we learned to face the constraints and difficulties encountered during implementation. Fourth, based on our first-hand knowledge, we are able to suggest a number of measures to overcome these problems, and they were considered applicable to wider contexts.

A more comprehensive and systematic professional development strategy has to be carefully conceived and evolved. We would envisage at least five levels of actions. First, positive attitude and committed attitude of individuals is fundamental. Second, self-help groups with specific interest and focus should be encouraged. Administrative support and recognition of workload and achievement are useful for initiating and sustaining such change. Third, departmental groups with identified departmental strategic objectives need to be developed. Fourth, institution policy on systematic staff development on various professional aspects including teaching quality should be carefully planned with a good understanding of practical constraints in implementation. Implementation itself has to be coordinated. Finally, genuine quality culture with continual, self-generated improvement effort can be promoted through institutional collaboration. Through joint institutional activities, innovations in professional development can be disseminated and shared. This also provides basis for community knowledge that will establish wider recognition and prestige.

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THE EFFECTS OF THE WHOLE EDUCATIONAL EXPERIENCE ON GRADUATE EMPLOYABILITY AND FURTHER STUDY

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Index: Student development, employability, extra-curricular activities

Abstract: A study of recent graduates was conducted in which their present status, campus life experiences, perceptions of their own performances in work or study, and suggestions on improving the curriculum design were explored. Altogether, 315 completed questionnaires were received and the result confirmed that students' campus involvement positively but weakly correlated with their perceived performances in both working and studying environments after graduation. To enhance students' involvement in attaining whole educational experience, group-based programmes involving peer activities are suggested.

INTRODUCTION

Pursuing vocational education represents an important aspect of the school-to-work transition. It provides pathways to occupations through training students to attain a basic requirement of a profession as well as the appropriate attitudes and work-place behaviour. However, employers nowadays also seek, in addition to academic qualifications, various personality qualities, attitudes and personal attributes which classroom learning alone might not be able to provide. These personal qualities cannot be taken for granted even in graduates with very good academic qualifications. The ability to communicate, together with good motivation, potential leadership qualities, breadth of outlook and a positive attitude to change, are obvious requirements alongside technical and specialist skills.

In recent years, tertiary institutions have given more attention to the out-of-class experiences of students. The Education Commission (1999) recently suggests that admission to university should consider students' all round performances, and not just their public examination results, whereas students in formal higher education institutions should enjoy a comprehensive and rich campus life. So there is a need to "provide a better physical and learning environment to attract able students and foster their total development"[1] through providing activities and programmes to enable students to gain a broader educational experience (Pomfret & Lai, 1999b). These activities can improve personal

[1] Goal 3 of the seven main Goals outlined in the *Total Quality Improvement: A Quality Policy dedicated to all staff within the VTC* (*VTC Quality Policy*)

attributes, such as communication and interpersonal skills, social and aesthetic sensibilities, physical wellbeing and a better appreciation of society and the world at large.

In an ever more competitive world, these life skills are essential. The cornerstone of whole educational experience lies in the involvement of students in campus activities. However there appears to be little local information available on the relationship between wholehearted and effective extra-curricular activities participation and subsequent success in employment, further study and personal achievement. However, large numbers of studies of college undergraduates in the States (Pascarella & Terenzini, 1991) have shown clearly that the greater the student's degree of involvement, the greater the learning and personal development. Whereas recent research findings even support that many important learning outcomes are negatively affected by various forms of "noninvolvement" that either isolate the student from peers or physically remove the student from the campus, such as attending part-time or being employed full-time (Astin, 1999). In this paper, we intend to explore the general performances of graduates in work or in study in relation to their campus involvement when they were students and consider strategies to enhance students' involvement to attain the whole educational experience goal.

GRADUATES' SURVEY

In an attempt to gain more insight into this area, a survey on the "Graduates' Campus Involvement, Views on Course Improvement and General Performance in Work and Further Study" was conducted in March 2000 for all graduates of full-time Certificate and Diploma courses at the Hong Kong Institute of Vocational Education (Morrison Hill) in Hong Kong. These students graduated in July 1999, after completing one- or two-year courses, and a questionnaire was sent to each graduate in March 2000. Altogether, 614 questionnaires were sent out and 315 completed returns were received through the mail. The response rate was 51.3 per cent, quite a reasonable rate for a mailed-returned survey. It is worth noting that out of all samples from those 19 classes of graduates (N=315) from five academic departments, 4 classes are one-year certificate course graduates (n=60). The present status of all the graduates, their campus life experiences, perceptions on their own performances in work or study, and suggestions on improving the curriculum design are explored.

Study Design

As a follow-up survey (see Pomfret & Lai, 1999a), part of this questionnaire is based on the "Supportive Educational Experiences Questionnaire" (SEEQ), with reference to the design of the "College Students' Experience Questionnaire" (CSEQ) of Robert Pace (1990) and the adapted version of the "University Student Experiences Questionnaire" (USEQ) of Richard Armour and Cheng Wai-ning in Hong Kong. Besides, the instruments used in two local surveys for employers of graduates (Li & Lee, 1998) and high school leavers (Cheung & Lewis, 1998) are also referenced. The self-administered close-ended mailed questionnaire for this study mainly consists of two sections. In the first section, respondents are asked to indicate their frequency in using various facilities and services in the campus by choosing along a four-point scale ranging from "very often" to "never", scoring from 4 to 1 respectively, based on their own subjective judgement instead of quantifying measures. Besides, graduates are asked to express their opinions on various suggestions for the improvement of IVE's diploma courses. The second section consists of questions relating to their personal perception of their own performance in various areas in their present working or studying environment. Respondents are asked to choose along a four-point scale for each area, according to their self-perceived performances, ranging from "excellent" to "unsatisfactory".

Respondents' Profile

Nearly two thirds (62.1%) of all respondents were male students. A significant proportion (48.0%) of the students were over 20 years old. Respondents were quite proportionately distributed with respect to the number of graduates from different departments, Commercial Studies being the highest (35.9%) and Construction (10.8%) being the lowest. Most respondents were having an overall academic award at the "pass" level (67.3%), followed by those obtaining "credit" (28.6%), a distribution quite able to reflect the overall status of graduates. Among all respondents, only 30.3% of them reflected that they had been involved in a part-time job during their final year of study, out of which 35.2% of them worked for 6 to 10 hours per week on average. About half of all respondents (49.4%) revealed that they were currently employed, 42.4% were pursuing further study, and the remaining 8.3% were not in employment or in further study as at the beginning of March 2000. Out of those who were employed, 64.7% of them reflected that their present job was relevant to their course of study, and 43.9% of them also were engaged in part-time study.

Findings

Respondents were asked to indicate how often they utilized campus facilities and services during their previous academic year. According to the graduates' self perception in utilization of facilities and services provided when they were in campus, they would rank themselves as "very often", "often", "occasionally" and "never", each with a score of 4, 3, 2 and 1. It is reflected that "using computers outside time-tabled lessons" (M=2.41, SD=.84) is the most common activity for students. In fact, computer utilization is believed to be mostly academically related. Consonant with the results of our previous study in April 1999, students' interest in extra-curricular activities is generally low, especially in areas such as attending courses on personal development topics (M=1.30, SD=.55) and participating in inter-departmental or inter-campus sports team (M=1.41, SD=.81). As nearly one third of our respondents engaged in part-time jobs during their studies, this might account for one of the reasons of low involvement.

Additionally, respondents were asked to express their personal views on various suggestions on the improvement of IVE's diploma courses. Out of all respondents, 85.3% of them "strongly agree" or "agree" for improvement of library facilities with more up-to-date publications and reference materials (M=3.35, SD=.76) and 82.8% of them on further modernization of campus recreational and teaching facilities (M=3.18, SD=.73). It should be noted that quite a significant proportion (77.3%) of our graduates "strongly agree" or "agree" to incorporate broader training, such as leadership skills, knowledge of world-wide issues, interviewing and presentation skills, problem-solving techniques, etc. into the curriculum (M=3.15, SD=.8). As the general involvement of students in campus activities is relatively low, it is not strange to note that only 39.3% of the respondents "strongly agree" or "agree" to the suggestion that students' participation in extra-curricular activities should form part of overall assessment (M=2.35, SD=1.00). Since, at the moment, students' active involvement in campus life is not being recognized in their testimonials, we cannot expect our students to spend more time in extra-curricular activities when their counterparts are working hard to attain outstanding academic results, and only the latter is officially reflected and recognized in performance transcripts.

Graduates were asked to reflect views on their own performances in their present working environment, along a Likert-type scale ranging from "excellent" (4) to "unsatisfactory" (1). For those graduates who are employed, 75.6% of them indicate that they are either "excellent" or "good" in establishing good relations with colleagues (M=2.99, SD=.75). Other self-perceived strong areas include "flexibility and adaptability in managing tasks" (M=2.72, SD=.75) and "involvement in team work" (M=2.72, SD=.73). On the other hand, our graduates revealed that they are relatively weak in "commercial acumen" (M=2.06, SD=.70) and "ability to communicate in English" (M=2.10, SD=.64). For those who are pursuing further study, their self-perceived areas of strength and weakness are quite

similar with those who are employed. But it is worth noting that graduates are comparatively performing better in the working environment than in further study, at least in their own perception.

It was intended to study if there are differences between the students' involvement in campus activities and their perception of their own performances in work and in further study. In correlation analysis, the study employs the Pearson product moment correlation coefficient (Pearson's *r*). Values of the correlation coefficient (*r*) range from 0 (no relationship) to + or – 1.00 (a perfect relationship). A negative relationship is indicated by a minus sign and a positive relationship by a plus sign. As a result, from analyzing the respondents' data, we might conclude that students' involvement in campus life is positively correlated with their self-perceived working performances after graduation, especially in the areas of "commercial acumen", "analytical reasoning when facing challenges" and "innovative capacity", but such correlation is rather low (see Table 1). From another angle, we might realize that students who are more actively involved in volunteer social services organized by civic education coordinators, student counsellors and student clubs on campus perform better in work (12 out of 16 areas of perceived working performance). Whereas, on the other hand, for those students who are pursuing further study, campus involvement is also low, but positively correlated with individual instead of all areas of their own perceived performances in study, especially in areas relating to "involvement in team work" and "flexibility and adaptability in managing tasks". We might also realize that students' utilization of library facilities and participation in team-work projects have slight statistical significance in most areas of performances in further study (see Table 2). Comparatively speaking, students' active involvement in campus activities is positively correlated with their performances in work more than that in pursuing further study.

Besides, from the data collected in this study, we can only conclude that graduates' ability in taking up early first full time employment was only slightly correlated with their frequency in "attending events organized by student bodies" (n=154, r=.174, p=.031) and "participating in working committee's meeting of a student organization" (n=155, r=.179, p=.025). Whereas, when overall academic result was concerned, it was reflected that there was only a slight correlation between good academic results with students' "utilization of computer on campus outside time-tabled lessons" (N=314, r=.176, p=.002), "attendance of events organized by study bodies" (N=314, r=.156, p=.006) and "participation in inter-departmental or inter-campus sports team" (N=315, r=.117, p=.038).

CONCLUSION

The study confirms that the students' campus involvement positively but weakly correlates with their perceived performances in both working and studying environments after graduation. Among various areas of campus involvement, students' participation in social services is most significantly correlated with good performance in work, whereas their involvement in teamwork projects and frequent utilization of library facilities are positively correlated with their ability in further study. Although our study cannot fully support the importance of students' campus involvement as a powerful means of enhancing performances after graduation just from the students' self-perceived measurement based on subjective judgment, a growing body of research suggests that active involvement gives rise to changes in affective and cognitive outcomes when more quantifying psychological instruments or observations and reports of behaviour, accompanying with carefully controlled measures researched over many years, are employed (see Astin, 1977, 1993, 1999; Kuh, 1993; Kuh, Krehbiel & MacKay, 1988; Pascarella & Terenzini, 1991). However, our recent study may serve as a baseline for future surveys in the vocational education sector.

As proposed in the recently published *Education Blueprint for the 21st Century* by the Hong Kong Education Commission (1999), it is clearly stated that "students should have a comprehensive learning experience through formal, non-formal and informal modes." However, students' out-of-class

involvement is not fully recognized under our existing assessment scheme, and it is time to consider if some form of modification could be made, such as systematically inputting students' campus involvement and participation data into their transcripts, issuing certificates to recognize active students involvement in campus-wide programmes and community services, etc. In the short run, to improve IVE's curriculum and campus facilities in meeting the needs of our graduates, it is worth to emphasize more on improving library facilities, encouraging teamwork projects during coursework, enhancing social service opportunities in serving the community and incorporating broader training, such as leadership skills, knowledge of world-wide issues, interviewing and presentation skills, and problem-solving techniques into the curriculum. Whereas, in the long run, IVE might need to review its assessment criteria to incorporate students' out-of-class involvement performances into the overall assessment scheme, following whole education principles, and borrowing the system of nearly all tertiary education institutions in Mainland China[2] or the City University of Hong Kong.[3]

Recent research findings confirm that the strongest single source of influence on cognitive and affective development is the student's peer group. In particular, the characteristics of the peer group and the extent of the student's interaction with that peer group have enormous potential for influencing virtually all aspects of the student's educational and personal development (Astin, 1999). Generally speaking, the greater the interaction with peers, the more favorable the outcome. Indeed, our study also reflects that "participation in teamwork projects with other students" is the highest form of students' involvement in campus. Peer group influence is powerful because it has the capacity to involve the student more intensely in the educational experience. So, to achieve the goal of whole education experiences, the campus should start from group-based activities in which peer groups are involved. Student affairs work in general should play a much more central role as most peer groups operate primarily outside of the formal classroom, and much of that out-of-class life falls under the purview of student affairs.[4]

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[2] Like other tertiary education institutions, the South China Normal University adopts a "comprehensive appraisal system" (????) in which students' performance in all three areas, namely, moral behaviour, academic performance and cultural/sports involvement, is transferred into "points" for recognition of awards when graduated (see Lai, 1999b). Behaviours are quantified and measurable and points will be added or deducted according to the performances. Each area carries a weighted percentage of 20%, 70% and 10%, out of 100%.

[3] The Student Development Services of the City University of Hong Kong launched a "Whole Person Development (WPD) Award Scheme" to encourage and motivate students to take part in various programmes related to seven areas of development, namely, spiritual, intellectual, physical, social, aesthetic, career and emotional, to become all round persons. Points will be awarded to students after attending programmes according to duration and the extent of involvement. Depending on the points gained, students will receive either the Award of Achievement or Award of Excellence.

[4] Interested readers can also refer to Lai (1999a) for a more detailed analysis of ways to enhance students' involvement.

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Table 1: Pearson Correlation Coefficients (r) of Campus Involvement with Working Environment Performance (n=156)

	Campus facilities and rooms	Events atten-dance	Athletic /aquatic partici-pation	Joined sports team	Social services	Sought help from another student	Attend personal develop-ment course	Attend civic educa-tion pro-grams	Use sports facilities outside lessons
Knowledge and skills for jobs	.093	.146	.012	.059	.170*	.181*	.114	.202*	-.040
Ability to communicate in English	.170*	.195*	.101	.153	.256**	.138	.169*	.091	.085
Ability to communicate in Chinese	.191*	.140	.153	.211**	.186*	.179*	.130	.121	.111
Analytical reasoning when challenged	.317**	.212**	.228**	.274**	.245**	.194*	.213**	.086	.298**
Observance of safety precautions	.124	.108	.130	.106	.127	.202*	.166*	.187*	.081
Ability in job planning	.153	.118	.102	.096	.144	.218**	.092	.177*	.135
Presentation in front of a group	.153	.208**	.213**	.260**	.152	.097	.149	.064	.122
Has good relations with colleagues	.078	.217**	.077	.134	.111	.208**	.148	.110	.104
Innovative capacity	.234**	.212**	.122	.156	.235**	.188*	.201*	.180*	.300**
Ability to grow and learn on my own	.165	.226**	.069	.154	.292**	.120	.132	.216**	.119
Flexibility and adaptability in managing tasks	.118	.129	.184*	.068	.198*	.191*	.200*	.093	.076
Ability to persevere and get results	.174*	.147	.117	.119	.198*	.186*	.059	.211**	.066
Common sense in dealing with problems	.079	.110	.108	.143	.184*	.103	.169*	.126	.005
Commercial acumen	.248**	.160*	.251**	.264**	.280**	.192*	.291**	.194*	.296**
Awareness of the ethical values and moral concerns in the workplace	.057	.115	.132	.144	.195*	.135	.111	.105	-.023
Involvement in team work	.121	.195*	.138	.241**	.228**	.281**	.146	.266**	.154

* Significant at 0.05 level (2-tailed) ** Significant at 0.01 level (2-tailed)

Table 2: Pearson Correlation Coefficients (*r*) of Campus Involvement with Further Study Performance (*n*=133)

	Use of library	Use of com-puter	Athletic /aquatic partici-pation	Joined sports team	Social services	Sought help from another student	Attend personal develop-ment course	Parti-cipate in team-work project	Use sports facilities outside lessons
Knowledge and skills required	.385**	.057	.126	.195*	.178*	.103	.063	.271**	.014
Ability to communicate in English	.257**	.259**	.205*	.167	.172*	.059	.164	.117	-.006
Ability to communicate in Chinese	.131	.199*	.106	.152	.026	.049	.096	.067	.157
Analytical reasoning when challenged	.112	-.094	.225**	.108	-.062	.050	.000	.170	.127
Observance of safety precautions	.109	-.115	.181*	.089	.105	-.075	.024	.002	.123
Ability in job planning	.092	-.024	.141	.158	.147	.137	.163	.165	-.061
Presentation in front of a group	.203*	.053	.057	.174*	.009	.059	.166	.220*	.015
Has good relations with classmates	.027	-.138	.118	.186*	-.011	.035	.058	.115	.167
Innovative capacity	.163	-.010	.197	.027	.044	.020	.104	.076	-.021
Ability to grow and learn on my own	.325**	.046	.112	.026	.103	.114	.134	.347**	.015
Flexibility and adaptability in managing tasks	.247**	-.050	.180*	.080	.177*	.210*	.096	.238**	.016
Ability to persevere and get results	.239**	.200*	.108	.026	.063	.050	-.010	.222*	.072
Common sense in dealing with problems	.181*	-.047	.114	.107	.135	.142	.066	.184*	-.023
Commercial acumen	.214*	.008	.206*	.172*	.189*	.041	.108	.152	.042
Awareness of the ethical values and moral concerns in your study	.152	-.005	.209*	.165	.149	.053	.103	.181*	-.037
Involvement in team work	.160	.052	.237**	.215*	.101	.187*	.217*	.334**	.251**

* Significant at 0.05 level (2-tailed) ** Significant at 0.01 level (2-tailed)

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FLEXIBLE LEARNING PROGRAMME IN VOCATIONAL EDUCATION: A CASE STUDY

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Abstract The Vocational Training Council (VTC) is undergoing a transformation that has reshaped many aspects of its organization; in particular, the course design and the way these courses are delivered. This paper presents a case study of the planning and design of a typical part-time vocational course curriculum at the Hong Kong Institute of Vocation Education (HKIVE). It outlines the considerations that the course team has to face. First, the aims of the Higher Certificate and Higher Diploma courses are highlighted. The major influence on the course aims for the curriculum, the social and economic efficiency factor, is discussed. A further aim, the learner-centered consideration, is identified. Given clear aims, goals and objectives, the design of the course structure proceeds. Subsequently, a suite of curriculum is proposed.

1. INTRODUCTION

The VTC is now undergoing a transformation that has reshaped many aspects of its operation, ranging from management structure to the design of the courses and the way they are delivered.

This transformation focusses on a new mission statement:

> *"To provide high quality, cost-effective, internationally acceptable vocational education, training and qualifications for student of all ages, directly applicable to the requirements of Hong Kong's employers"*

To implement this mission, seven objectives have been identified [1]. These objectives include the creation of an environment in which the various major components associated with the VTC, such as the employer, students and employees can play an effective and collaborative part in realizing the mission. This requires a radical change in the organisation's structure and culture.

Among the many reforms and restructuring, the radical change in the design of its courses has the most far ranging effect. This requires the VTC to have a shift of paradigm in course design and the way these courses are delivered. This paper presents a case study of the planning and design of a typical part-time vocational course curriculum at the Hong Kong Institute of Vocational Education (HKIVE). It outlines the considerations that the course team has to face.

Section 2 outlines the current practice in the operation of part-time courses in HKIVE. Together with an overview of the needs for a flexible learning program, it gives some background on the various considerations needed for the new courses.

In section 3, the aims of the Higher Certificate and Higher Diploma courses are highlighted. The major influence on the course aims for the curriculum, the *social and economic efficiency* factor, is discussed. The focus of intentions, contents, learning and assessment are also discussed.

Given the clear aims, goals and its various focus, section 4 details the design of the course structure. Subsequently, a suite of curriculum is proposed based on the new design paradigm. The course

planning team focus on an approach based on flexible learning in which the learning program of the curriculum places emphasis on flexible learning and transferable skills. A Module Accumulation (MAC) course structure is proposed so that the learning program has a framework of flexibility. Finally, the overall design of these two courses is presented in Section 5 together with some practical considerations.

2. COMPARISON OF CONVENTIONAL COURSE AND FLEXIBLE LEARNING PROGRAM

Traditionally, the HKIVE courses have a rigid curriculum and timetable based on the academic year. Enrolling on courses begins in September and the academic year ends in the summer term. The learning is arranged in a fixed sequence, with assessment occurring at a fixed point for the whole group of students. Courses have an integrated curriculum designed by a course planning team and accredited by awarding and professional bodies[3].

More recently in vocational education, there has been a trend to provide a coherent curricula within a diversified course structure[4]. In contrast to the conventional course, a learning program provides an initial guideline, counseling and assessment to establish individual starting point. Flexible learning program is a major innovation in curriculum to address the requirement of flexibility and diversity, particularly appropriate to students already in the workforce. It challenges the conventions of the traditional taught course structure. Entry and exit points for the learner depend on achievements both prior to and during the study. There are no assumptions about the pace of the learning. The delivery of the learning program is not constrained by the conventional academic year. Programs are constructed using the building block of a module (or credits). The differences between the conventional taught course and a flexible learning program are highlight and shown in Table 1.

Flexible learning program is the key to this proposal in which a Module Accumulation Course (MAC) structure is the major vehicle to implement a viable and cost effective vocational training program.

Stage	Conventional Course	Flexible Learning Program
Before entry	• Students choose a specific course to study • Each course contains a pre-determined group of subjects, related to a particular profession.	• Students choose a discipline of study with the specific curriculum being selected later • Different modules can lead to a range of different qualifications • Students can join the program at different points (recognize prior learning) • Select initial rate of study
At entry	• Based on previous qualifications • Require subject-based induction	• Based on the principle of open access • Need guidance on module choice • Require induction into the structure of the program
During Program	• Curriculum is compulsory and delivered over a set period of time and in a set sequence • Learning style is based on pedagogy[1]	• Student can maximized the effectiveness of the modules to achieve different qualification outcomes and match their vocational needs • Learning style is based on Andragogy[2]
At exit	• Student will attain the qualification	• Student will have choice over the qualification outcome at exit which depend on the module combinations

***Table 1** : Comparison of Conventional course and Flexible learning program*

2.1 Flexible learning program in IVE

A review was conducted into the operation of Higher Certificate courses within the former Technical Colleges of the VTC and it recommended the adoption of a more flexible approach to course delivery. This was in response to the acknowledged high attrition rates on the courses, with an overall cohort completion rate of 53%. Subsequently, the General Academic Regulations were amended to support the Module Accumulation (MAC) model and a working party established in March 1999 to formulate guidelines for their operation.

The Department of Electrical & Communications Eng. conducted a pilot course design exercise for two PTE courses (HC and HD in Telecommunications Engineering) which will start their MAC mode of operation in Sept. 2001. To establish a flexible learning program, the following provisions are necessary :

- a mission and set of policies

[1] The art and science of teaching children, it is more commonly associated with teacher-dominated approaches to learning

[2] The theory of adult learning, which stresses the value of approaches which build upon the exiting experience of the learner.

- the provision of resources for student guidance
- a unit-base program designed to accommodate the different needs of individual learners
- procedures for recognizing prior experience
- MIS capable of tracking individual learners

This gives course planners some parameters for its course design process.

3. AIMS, GOALS AND OBJECTIVES OF THE LEARNING PROGRAMME

As far as curriculum design is concerned, there are two main aims of the part-time Higher Certificate (HC) and Higher Diploma (HD) in Telecommunication Engineering. The prime aim is to produce Associate Engineers in the field of Telecommunications Engineering who will be capable of satisfying the needs of industry and commerce in Hong Kong. It achieves this by providing persons with a suitable technical education that will enable them to take up careers where they can make a valuable contribution to the design, operation and maintenance of telecommunications systems. This type of particular aim is viable for adult education. The second aim is to satisfy the needs of the individual learner to obtain a vocational education that can provide them with a career path so that they can integrate into the society.

In vocational education, a strong element of the *social and economic efficiency* factor is embedded in the course aims. As far as curriculum design is concern, four components encompass this approach, namely: *intentions*; *contents; teaching/learning methods*; and *assessment*[2]. The focus of each component is:

1. *Intentions* : to provide for the current and future manpower needs of society
2. *Contents* : to focus on knowledge and skills which are useful and relevant to future employment
3. *Teaching/learning methods* : to emphasize application and skill mastery
4. *Assessment* : to emphasize assessing students' ability to apply knowledge and skills

3.1 Intentions

For part-time courses, there is a lesser requirement to accomplish its main *intentions*. Most of the learners already have a job in the related field and they possess some of the skills and knowledge before enrolling on the course. However, in a fast moving industry such as telecommunications, skills and knowledge can become obsolete in just a few years. There is a strong intention and incentive for these learners to engage in life long learning. Thus, the intention of the course is to produce graduates who are capable of self-learning and provide a framework for on-going self learning. Life-long learning is an increasingly important skill for learners to meet the changing needs of the society and industry.

3.2 Contents

The focus of the *contents* of the course is to provide career-oriented training for part-time HC and HD students. Often, the learner is the best person to plan his/her learning to best match his/her career planning. Thus, flexible learning is essential to contemporary vocation education to allow the learner to decide which relevant knowledge and skills to acquire and the best mode of studying. It also reinforces training to plan their own career and professional development.

Using this approach, the learner can decide which knowledge and skills will be most useful in the fast moving telecommunications industry. In addition, they can decide the pace of learning. Study becomes a partnership between the teacher as facilitator and the students as client.

3.3 Teaching and Learning Methods

The learning program was designed to include a range of attainments, including development of inter-personal skills, practical skills and technical skills. The five themes of the learning program identified are:

1. Practical and Professional Skills - economic considerations and management
2. Embedded Systems and Instrumentation - role of computing and experimental techniques
3. Electronic Principles and System Design - principles of electronic engineering and communications theory
4. Communications Theory - fundamentals of telecommunications engineering
5. Applications to Communications Systems - application of principles to real systems and networks

The five themes identified are practical in nature and designed to meet the needs of local industry and commerce. As a whole, they also satisfy the personal growth of the individual.

In the planning of the course, these themes are identified in three aspects: *knowledge, skill* and *attitudes*. *Knowledge* corresponds to the cognitive domain in six categories: *recall, comprehension, application, analysis, synthesis* and *evaluation*. Each category involves a higher degree of complexity than the one preceding it. The coverage of knowledge is addressed in the themes of the learning program. In particular, higher levels of cognitive skill, such as the ability to apply principles, the power of analysis and evaluation, are encouraged in the senior level of the course.

Skill involves the ability to perform a task (either physical or mental). This corresponds to the psychomotor domain. Practical skills are identified and integrated into the Course so that physical skills are the attainments. Likewise, communications skills and the ability for critical observation are considered to be mental skills which they are promoted in the learning themes of the Course.

Attitudes deal with the way of thinking about something and can be described in the affective domain (concerned with feelings). It can refer to a student's attitude to himself/herself, his/her family and friends, his/her job or society in general. Professional ethics, cooperation and tolerance are examples of values which this course tries to encourage. It is more difficult to describe and measure this learning outcome from the learning themes of the Course, but these elements of learning (i.e. attitudes) are considered throughout the design of the Course. For example, the study units of Project, QA and Project Management encourage the learning outcomes that students can work both in a team and perform tasks independently.

With these design parameters in mind, the overall learning outcome should ensure the students can:

1. understand the basic underlying theory of telecommunications systems;
2. utilise computers and embedded systems in the design, evaluation, control and instrumentation of communications systems;
3. apply basic electronic circuit design techniques in telecommunications systems;
4. appreciate the characteristics of the various types of telecommunications system encountered in Hong Kong; and

5. make a contribution to the overall design, implementation and operation of a communications system.

3.4 Balance of Assessments and Assessment Framework

Creating a comprehensive assessment framework is one of the most important tasks for a curriculum designer. From the viewpoint of the learners and instructor, assessment fulfils two main functions. First, it has an element of *formative* assessment. It offers feedback to the learner about his or her strengths and weaknesses and identifies measures needed to improve performance, for both learner and instructor. Second, it provides evidence for a grading decision. This is known as *summative* assessment.

In many vocational courses, it is desirable that the assessment of the learning program is based upon the assessment of performance in the workplace or an environment similar to the workplace. This can be broken into units of competence which are assessed through performance criteria related to each competence. When candidates are judged to have achieved all the elements of competence necessary for competent performance of the particular occupational role, they become eligible for the aware of HC or HD. Table 2 outlines the essential assessment tools when assessing learners in their affective, psychomotor and cognitive domains. These are also based on holistic assessment in which different elements and evidences are collected as part of the assessment. The evidence may take many forms. Although it is desirable to collect different evidence to give an accurate representation of the students' level of competence, it is understood the tasks could become very tedious and expensive to operate. For each module, there are many specific learning outcomes in which evidence can be collected. In vocational education, many of these should rely on competence based assessment. Nevertheless, the following factors need to be considered when the assessment framework is planned:

- Accessibility : A good assessment should aim to be transparent. This means that the learner has the right of access to all information on how he or she is to be assessed. The use of a computer-based MIS allows students to query their own academic standing. It also facilitates the tutor entering state marks effectively.
- Consistency : The course team agree on a consistent approach to issues such as grading and the timing and nature of individual assessments. This forms part of the teaching and learning package that is commonly shared by teaching teams.

Affective domain

1. testimony of others e.g. supervisors, clients
2. simulations/role plays
3. projects

Psychomotor domain

1. observation of workplace activity (or activity related to workplace such as trouble-shooting, installation)
2. candidates portfolios with extensive record of work
3. observation of workplace products e.g. records, reports, schematic diagram, program, etc

Cognitive domain

1. examination of knowledge context
2. assessment of prior achievement
3. oral questioning
4. project work

***Table 2** : Essential Tools for Competence Based Assessment*

The method of assessment is another important aspect that the course team needs to consider. Efforts were made to ensure the *validity* and *reliability* of the assessments. Assessment plays a major role in a course with Module Accumulation. A pragmatic approach was adopted where existing practice in assessment can fit in with the new course design. In particular, the year-end examination is replaced with an end-of-module assessment. An assessment framework is proposed to allow flexibility and practicality. In particular, competence based assessment is advocated where learners are being assessed in all aspects of knowledge, skills and attitudes.

4. OVERALL DESIGN OF THE COURSES

The learning themes are divided into 3 areas or grouping which are based on the full-time D/HD in Telecommunications of the IVE Electrical & Telecommunications Course Board. Table 3 shows the learning program consisting of modules from *support*, *core* and *elective* groups. There are 16 credits, 20 credits and 16 credits in each group respectively. Students are free to choose from these modules, but to be eligible for award of HC in Telecommunications, he/she is required to have a total of 36 credits. In particular, a minimum of 8 credits is chosen from the support group. Likewise, he/she needs to have a minimum of 20 credits from core group and a minimum of 8 credits from elective group respectively. A total of 36 credits is required which is equivalent to 540 hours of class contact.

Group	No. of Credit	Lecture/tutorials : lab (contact hours)	pre-requisite
Support			
Engineering Maths II	4	60 : 0	Engineering Maths I or equivalent
Supervisory practice	2	30 : 0	NIL
Putonghua	2	0 : 30	NIL
English & Communication 2	4	60 : 0	English & Comm I or equivalent
QA & Project Management	4	45 : 15	NIL
Core			
Communication Electronics	4	45 : 15	COI, Introduction to Computer,
Telecom Principle 1	4	45 : 15	Electrical Material, Circuit Theory (Fundamental Knowledge in Electrical Principle)
Telecom Principle 2	4	45 : 15	TP1
Data Comm	4	45 : 15	COI, Introduction to Computer, uP Systems
uP systems	4	45 : 15	COI, Introduction to Computer,
Elective			
Enterprise Network	4	45 : 15	Data Comm, TP1, TP2, Comm Electronics
Mobile Communications	4	45 : 15	Data Comm, TP1, TP2, Comm Electronics
Comm Electronics	4	45 : 15	COI, Introduction to Computer,
EMI/EMC	4	45 : 15	Instrumentation

***Table 3** : Modules available in HC in Telecommunications Engineering*

Similarly, in the program of HD in Telecommunications Engineering shown in Table 4, students are required to take appropriate modules from different groups. Again, there are 8 credits, 8 credits and 36 credits in each group respectively and students are free to choose from these modules. For a student to be eligible for HD in Telecommunications, he/she is required to have a total of 36 credits in which a minimum of 8 credits is selected from the support group. Likewise, he/she needs to have a minimum of 8 credits from core group and a minimum of 20 credits from the elective group respectively. Again, a total of 36 credits is required which is equivalent to 540 hours of class contact.

Group	No. of Credit	Lecture/tutorials : lab (contact hours)	pre-requisite
Support			
Putonghua	2	0 : 30	NIL
Supervisory practice	2	30 : 0	NIL
QA & Project Management	4	45 : 15	NIL
Core			
Project	8	120: 0	at 4 elective taken form the HD courses
Elective			
LAN & WAN	4	45 : 15	Data Comm, TP1, TP2,
Broadcast & Multmedia systems	4	45 : 15	Data Comm, TP1, TP2,
Telephony	4	45 : 15	Data Comm, TP1, TP2
Broadband & Optical Communications	4	45 : 15	Data Comm, TP1, TP2, Comm. Electronics
Wireless Information Network	4	45 : 15	Data Comm, TP1, TP2,
Radar & Electronic Navigation System	4	45 : 15	TP1, TP2, Comm Electronics
Satellite Communications	4	45 : 15	TP1, TP2,
RF and Radio Comms	4	45 : 15	TP1, TP2,
Mobile Communications	4	45 : 15	Data Comm, TP1, TP2,

***Table 4** : Modules available in HD in Telecommunications Engineering*

5. STUDENT PROFILE - SCENARIOS OF 5 PTE STUDENTS

To show the planning of these modules, Table 5 presents scenarios of five students with different background representing the market segments addressed by the course. As shown in Table 6 and 7, these hypothetical cases are to illustrate some preference of the students in choosing the modules that suit their career planning.

1. Technical officer, Technician, Ass Engineer of a Fixed Network Providers - HKT, NT&T, CATV
2. Service Technician, Ass Engineer, Engineer of Mobile Operator - Hutchinson, SmartTone
3. Service support - ISP - IMS, PSInet, Linkage
4. Technician, Service Engineer of Cable and Satellite TV broadcast - CATV, IMS, AsiaSat, C&W
5. Technician, Ass Engineer of Radio/Satellite - RTHK, Department Civil Aviation, Airport Authority, Marine Department, Royal Police

***Table 5**: Scenarios of 5 Students with background following the Course Target Segments*

	Student 1	Student 2	Student 3	Student 4	Student 5
Support					
• Maths II	✓	✓	✓	✓	✓
• English & Comm	×	✓	✓	✓	✓
• Supervisor Practice	✓	×	×	✓	✓
• QA & Project Management	✓	✓	✓	×	×
Core					
• uP	✓	✓	✓	✓	✓
• TP1	✓	✓	✓	✓	✓
• TP2	✓	✓	✓	✓	✓
• DataCom	✓	✓	✓	✓	✓
Elective					
• Mobile Comm	✓	✓	✓	×	×
• EMI/EMC	×	✓	×	✓	✓
• Comm Electronics	✓	×	×	×	✓
• Enterprise Network	✓	×	✓	✓	×
	40 credits	**36 credits**	**36 credits**	**36 credits**	**36 credits**

***Table 6**: Modules taken required in Higher Certificate in Telecommunications Engineering*

	Student 1	Student 2	Student 3	Student 4	Student 5
Support					
• QA & Project Management	×	×	×	✓	✓
• Supervisor Practice	×	✓	✓	×	×
Core					
• project	✓	✓	✓	✓	✓
Elective					
• LAN & WAN	×	✓	×	×	✓
• Mobile Comm	×	✓	✓	✓	✓
• RF and Radio Comm	×	✓	✓	✓	✓
• Broadband Comm & Optics	✓	✓	✓	×	×
• PSTN		✓	✓	×	✓
• Broadcast & Multimedia System	✓	✓	✓	✓	×
• Satellite Comm	✓	×	×	✓	✓
• Radar & Navigation	✓	×	×	✓	✓
• Wireless Information Network	✓	✓	✓	✓	×
	40 credits	**36 credits**	**36 credits**	**36 credits**	**36 credits**

***Table 7**: Modules taken required in Higher Diploma in Telecommunications Engineering*

6. PRACTICAL CONSIDERATION

In the traditional course structure, subjects are taught over the full academic year. To give greater flexibility to the learner, the module accumulation program is based on shorter semesters. A 15-week semester is proposed for each module. At the end of each module, a form of assessment such as written examination is used to measure students' attainment. Having a shorter duration, students can more quickly gain skills relevant to their jobs and have greater flexibility to vary their study load to match work commitments. Once a student has gained a sufficient number of credits, he/she is granted the appropriate award (HC/HD). Note that there is not rigid timetable to acquire the credits, rather, students have between two and five years to complete their studies. A typical academic calendar is shown in Table 8.

These proposed courses are yet to undergo validation and detailed operation still requires planning and implementation. The course team will continue to review the learning program and the balance of assessment within the rules and procedures of the IVE General Academic Regulations. The department is also making transitional arrangements to cater for students already enrolled on an existing course.

One concern for the MAC structure is the administrative workload related to the registration of students on the various modules. This can be addressed with suitable support of a MIS together with administrative staff.

Time	Events	Reference
Wk 0	Registration	
Wk 1-7	Lecture/tutorial	Mid of September
Wk 7-8	test and other module assessment	
Wk 8 - 14	Lecture/tutorial	
Wk 15	Revision	
Wk 16	**Exam**	**early of Jan**
Wk 17	Marking	
Wk 18	Module BoE	
Wk 19	Registration of next semester	Chinese New Year
Wk 20 - Wk 26	Lecture/tutorial	
Wk 26 - Wk 27	test and other module assessment	
Wk 27 - Wk 33	Lecture/tutorial	
Wk 34	**Exam**	**end of May**
Wk 35	Marking	
Wk 36	Module BoE	
Wk 37	Course BoE and IVE APC approval	end of June

***Table 8**: A typical academic calendar*

CONCLUSIONS

The implementation of a flexible learning program is new to vocational education in Hong Kong. It allows the learners to choose their pace of study and select modules that are relevant to their own needs. This paper shows how it can be applied to evening courses. The model is well suited to part-time students who are mature and in a good position to decide their own learning program within the course framework. The learners also have a stronger incentive as the learning program has greater impact on their career planning.

Criteria for selecting the study program are also outlined and hypothetical cases presented to show how learners from different telecommunication disciplines can select their own learning program to best match their requirement.

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DISCOVERY LEARNING APPROACH TO CLASSIC ELECTRICAL MACHINES PRINCIPLES

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Index: Courseware development and delivery

Abstract: This paper aims at presenting the concept of Socratic interactions and discovery learning of classic electrical machines principles. The theories of electrical machines are by nature quite boring and abstract although there are a lot of experiments supported the theories. Traditional, students learnt the subject by drill and practice approach with standard textbooks. In the past two decades, computer is no doubt recognized to be the educational tool. The so-called "interactive" approach is applied to the learning process. Most of this approach applied to various subjects in different levels is mainly based on drill and practice. However, few packages are developed for electrical machine subject. In this paper, two different approaches "Rote Learning" and "Discovery Learning" applied to the interactive computer aided learning package of classic electric machine principles are discussed. Design of a discovery learning approach will also be presented.

INTRODUCTION

In the last decade, considerably researchers and academics in the world drew significant attentions and contributions in the development of computer aided learning packages in various subjects of different level of studies. Both individual research papers and multi-million dollar funded projects generally address computer effectiveness in a particular situation; they set out to prove that this approach is "expedient". In accordance with the educational psychology, there are two approaches applied to the interactive computer aided learning package, namely Rote Learning and Discovery Learning. These two approaches based on different learning process hierarchies are suitable for different level of subject matters. In this paper, these approaches will be discussed. Moreover, the design of this discovery learning approach for electrical machine principles is also presented.

INTERACTIVE APPROACH

1. Rote Learning Approach

Rote learning approach is a logical approach based on a behavioristic modeling theory of learning. The subject material will be broken down into facts, the relationship among the individual facts or elements can be organized hierarchically. That means the subject material is composed of local knowledge: one fact leads to another fact that exists higher in the logical structure.

The teaching methodology of the rote approach involves presenting students with exercises and reinforcing their responses. This kind of drill and practice approach is able to let students learn the topic from easier level to harder level of exercises, each building on the previous experience of the learners and leading finally to knowing the specific topic of information.

This kind of learning package can act as a psychologist and collect empirical data on learners' behavior. Predictive performance models can be developed and tested on actual data. This in turn can

lead the design of the package that can better individualize the instructional path.

This rote approach is also called "drill-practice" approach has great appeal to primary and junior school levels with large populations of students who are not performing at grade level and need remedy. This approach has been proven to be successful in mathematics, reading skills and language arts.

The rote learning approach to education has strong support in educational practice. It also plays on the popular hopes that the learning packages can teach skills with which teachers have been unsuccessful, to populations with which school systems have been unsuccessful. In the rote learning approach, the computers are treated as intelligent, sympathetic instructors.

2. Discovery Learning Approach

Discovery learning approach is another learning approach differing from the rote learning approach in some subjects in which rote learning styles of teaching were not conductive to real learning. Basically, discovery learning approach is a pragmatic rather than a logical prism, so the mechanism of learning is seen as discovery.

The feature of the discovery learning approach is to set out to embed the learning environment, change the traditional classroom atmosphere and the dominant teaching style. The new learning environment is called "Scenario". A real environment would be simulated in the learning package to let learners explore by themselves. In case they need any help or computational tool, there are some guides and tools available for them. The learners best learn informally and through discovering for themselves. Psychologically, this theory received support from most of educational researchers in the world. This approach is able to understand the learners' thinking and provided a context for apprehending their thinking models by artificial intelligence method. The cognitive sciences, using computational metaphors and techniques, have provided further insights into mathematical thinking and ways of talking about learners' misconceptions. Electrical machines would be one of the subjects good for this learning approach. In this approach, graphics and visual representations play a great important role to stimulate the learner to discover and explore.

DESIGN OF DISCORVERY LEARNING APPROACH FOR ELECTRICAL MACHINES

A computer aided learning package has been developed to teach the subject of electrical machines for Higher Diploma level at Hong Kong Institute of Vocational Education. In the pilot stage, the three-phase induction motor would be taught by this package. This package is to support the normal classroom teaching and to let students learn by discovery of the real environments. The concept of the discovery learning approach is adopted in the package.

There are four main parts of the package.

1. Basic knowledge of three-phase induction motor.
2. Experiments.
3. Assessment.
4. Analysis and Result.

The flowchart of the package is shown in Fig. 1.

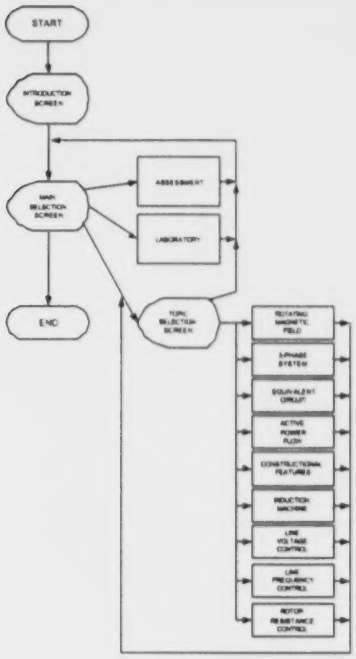

Fig. 1: Flowchart of the Package

This educational software has 9 sessions for the basic knowledge of three-phase induction motor. In this paper, focus will be mainly put on the topics which students found difficult to understand. There are:

- Rotating Magnetic Field
- Line Frequency, Voltage and Rotor Resistance Control
- Active Power Flow

Rotating Magnetic Field

The aim of this session is to let users know what the rotating magnetic field is and how to make the rotor to rotate.

In this session, it is divided in 2 parts. The first part is for basic learning, the second part is for detail study. For the first part, a two-pole induction motor is used to demonstrate the relation between the rotor, stator and loading. Users can adjust the loads by pressing the "load" buttons to visualise the changes in slip and speed when different loading is applied. Fig.2 shows the rotation of the rotor.

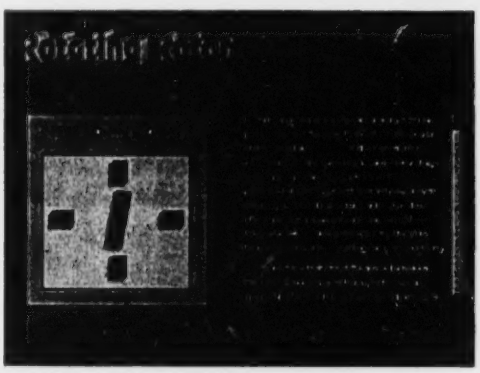

Fig. 2: Rotating Field

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In the second part, it is to focus more detail information of the rotating magnetic field.

Fig.3 shows the sinusoidal waves and the vector diagram represent the relationship between the instantaneous three-phase currents and the magnetic flux as time varies. Observing the "moving ball" shows the idea through the animation by observing the "moving ball".

In addition, users can view the movement of the rotating magnetic field that is shown in Fig.4.

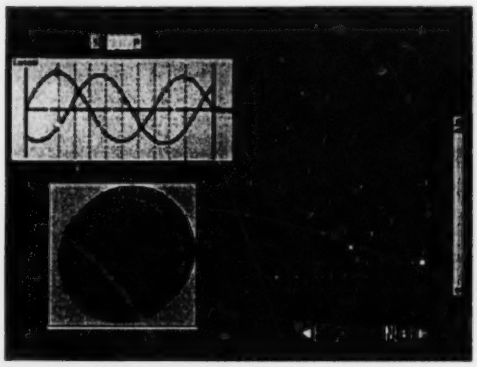

Fig. 3: Time and space movement

Fig. 4: Flux movement

Line Frequency, Voltage and Rotor Resistance Control

The aim of this topic is illustrate the effect of frequency change to torque-speed characteristics in changing frequency.

In Figs.5-7, diagrams with three buttons which are used to control the torque-speed characteristics when frequency is changed. The frequency is input by the users. "Calculate" button is used to plotted the torque-speed curve of the input frequency. When the "Frequency Change" button is pressed, the movement of the torque-speed curve is shown in the diagram with increasing frequency that can let users understand the concept by this interactive learning software package.

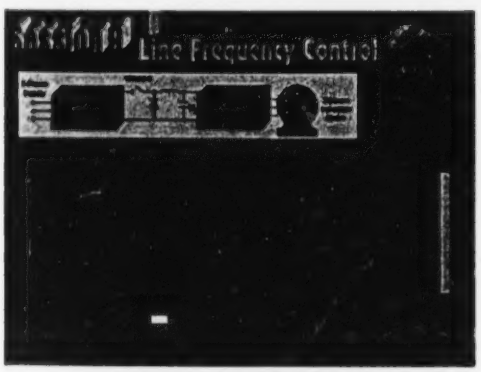

Fig.5: Line Frequency Control

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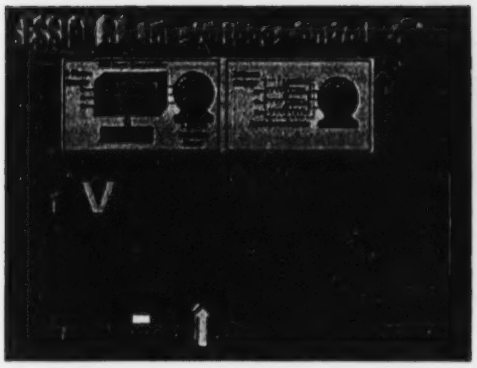

Fig.6: Line Voltage Control

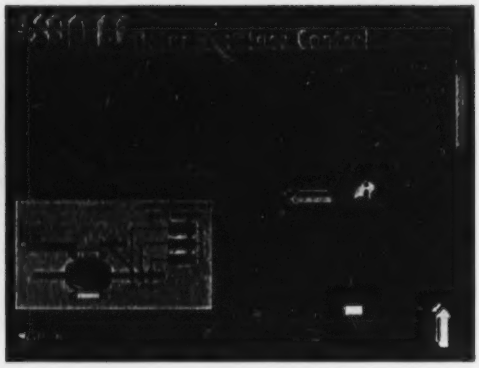

Fig.7: Rotor Resistance Control

Active Power Flow

The aim of this topic is to let users understand the power flow inside the motor when it is in normal operating condition.

In Fig.8, a switch button which is used to turn on the motor and when the motor is rotating, the arrows are shown gradually to represent the power flow inside the motor, including the iron, copper losses and frictional losses.

Fig.8: Active Power Flow

Laboratory

There are three major laboratories to let users explore the safety, wire connection and trouble shooting concepts.

In the first laboratory, a set of guides is ready for users to complete the laboratory. For example, when the users connect the Ammeter and the Voltmeter to the circuit, they have to make sure that the meters are connected in the proper connection, otherwise users will be warned by a "beep" sound. Besides, interchange of wires is not allowed.

After the circuit is connected, users can switch on the power supply, which in turn energize the motor, and hence they can adjust the resistance of the rotor starter and the slip value of the motor. Moreover, when we want to connect the wire, we should double click the terminal, at which we want to start the wiring, and then move the pointer to the other terminal, which is proposed to be the end of the wiring, and click it once.

In addition, the users cannot switch the power supply on, before the circuit is connected since this is

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very dangerous in real case. On the other hand, removal of any wires from the circuit is prohibited, while the switch is ON.

The torque-speed and current-speed characteristics can be visualized when the switch is on. The curves will be changed simultaneously when the loading or external resistance is adjusted.

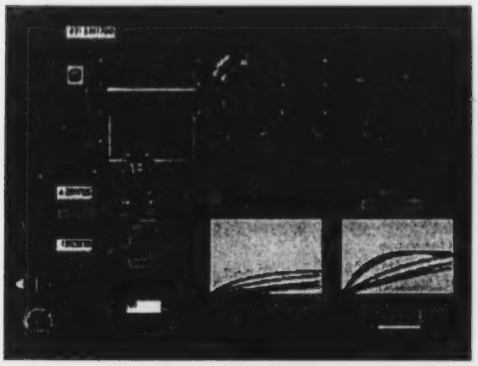

Fig 9: Laboratory 1

Fig 10: Laboratory 2

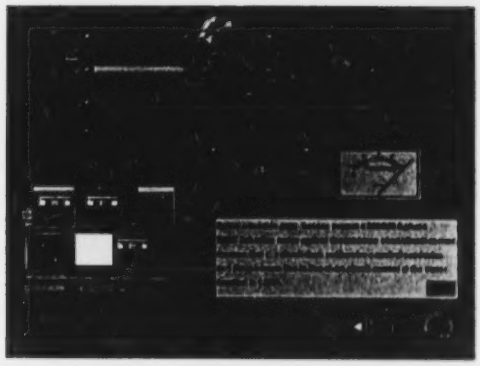

Fig. 11: Laboratory 3

CONCLUSION

With the discovery learning approach, the package has demonstrated the teaching of some classic theory in an interactive and discovery ways. A real environment would be simulated in the learning package to let the learners explore by themselves. In this approach, graphics, and visual representation play a great important role to stimulate the learner to discover and explore. It package is in use in the teaching of electrical machines in the Higher Diploma courses.

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RESEARCH AND PRACTICE OF HIGHER VOCATIONAL EDUCATION OF ENVIRONMENTAL ENGINEERING

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Index: Higher vocational education, Environmental engineering, Personnel training

Abstract: In China, the environmental protection industry is developing quickly, the environmental engineering education programmes have been forced to try to keep pace, it's necessary to develop the higher vocational education of environmental engineering to meet the demand for a great number correlative persons with comprehensive vocational capability. In this paper, the features of higher vocational education of environmental engineering are discussed. At the same time, the teaching programme establishment and practice of higher vocational education of environmental engineering are set forth also.

INTRODUCTION

Environmental engineering is a rapidly developing field of engineering owing to undefined risks of environmental deterioration and the complex nature of the present environmental problems. Especially in China, with the quick development of environmental protection industry, the demand for correlative technology and administration persons is increasing. Scientific running of environmental protection and environmental heath establishments need technological and practical people who have comprehensive vocational capability and can directly engage in production, service, technology, administration and operation of water supply, urban drainage, wastewater treatment, solid waste collection and handling systems on site. They differ from those academic and designing persons cultivated by usual discipline and teaching system, either differ from higher technology workers or technicians.

FEATURES OF HIGHER VOCATIONAL EDUCATION OF ENVIRONMENTAL ENGINEERING

The American Academy of Environmental Engineering (AAEE,1998) defines environmental engineering as "...the application of engineering principles to the management of the environment for the protection of human health, for the protection of nature's beneficial ecosystems, and for environment related enhancement of the quality of human life". The practical interpretation of this definition is that Environmental Engineers design and oversee the operation of water and wastewater treatment plants and measure and monitor pollutants in the air, on the land, and in rivers and lakes (Alha, et al., 2000). In recent years, the environmental engineering has mushroomed to include all aspects of the human and terrestrial environment systems (Bishop,2000), with increased emphasis on waste minimization, recycling and reuse to minimize the amount of wastes to be managed. At the same time, the education of Environmental Engineers, must be committed to the concept of sustainable development, so that the present society will not endanger the survival of future generations. And the environmental engineering education programmes have been forced to try to keep pace.

Higher vocational education is a new type education mode of personnel training, in which people's capacity is primary (Xu, et al.,1999; Zhao,1999). And it's guided by the requirement of social and economical reality and future development tendency. Which is based on solid speciality knowledge, also needs skills acquired through strict discipline, in the whole process of education teaching and training, we should pay attention to theoretical knowledge while stressing on vocational technology cultivation, and think much of methodology of new knowledge and new skills and edification of social capacity to adapt to changing time and social requirement.

The features of higher vocational education of environmental engineering are accordance with the training goal also. As a main goal, the graduates are to be enabled to work on a technical environmental problem in its entirety. The level they work at is not meant to be highly advanced and scientific, but rather practical and applied. The graduates should have a number of skills such as:

- the ability to oversee the different environmental compartments (water, solid and air),
- capability to apply engineering principles in order to implement technical solutions,
- can directly engage in production, service, technology, administration and operation of water supply, urban drainage, wastewater treatment, solid waste collection and handling systems on site,
- the engineers responsible for the management and quality assurance of raw materials, productsand waste streams in larger industrial enterprises, and
- the willingness for problem-oriented learning and continuing education as working engineers.

In general, high-tech information, high technology and high skills of environmental protection industry development, are basic features of higher vocational education of environmental engineering. Which should be run through the whole education process. The features of higher vocational education of environmental engineering include the following:

- Higher vocational education of environmental engineering is faced to the front line of environmental protection. It cultivates the advanced persons with perfect practical technology and skill needed by vocational post of environmental protection, and the persons with high technology, operation and management ability who can apply and operate environmental pollution treatment establishments, they can skilled work on site as soon as graduated from institute.
- The content of higher vocational education of environmental engineering are mainly mature fundamental theory, technology and administration criterion of environmental protection, its teaching programme and curriculum setting are determined by requirement for vocational capacity and vocational stuff adapting to environmental protection post group.
- Higher vocational education of environmental engineering should promote formation of correlative skills, mastering of technology and cultivation of stuff. Which is achieved through greatly setting and implementing of practice and cultivation curriculum needed by environmental protection vocation post. The setting and study of fundamental curriculum should supply more effective service for environmental protection practice and for achieving cultivation aim of our major.

TEACHING PROGRAMME ESTABLISHMENT OF HIGHER VOCATIONAL EDUCATION OF ENVIRONMENTAL ENGINEERING

Pay attention on training vocational post capability of environmental protection

Before establishing the teaching programme, it's necessary to go to the correlative environmental protection department, environmental health department and enterprises to realize the requirement for post capability. Based on the investigation as above, the staff room establishes the teaching

programme, then send to the units to emend and recognize. Finally, the speciality supervise committee discuss and confirm the effective teaching programme.

Insist on the motive consistency of education and environmental protection work

In the aspect of teaching material exploitation and curriculum setting, breaking away from the tie of systematic and integrality of subject education, spanning the frame of curriculum setting in general college. According to the necessary knowledge and capability structure for environmental engineering post, exploiting the curriculum with strong pertinency and synthesis in reason, such as "Running and management of waterworks and wastewater treatment plant", and so on.

Standing out practice teaching

An important aspect of the course is its practical orientation. Which is in according with the recommendations of the German Federal Ministry of Education, Science, Research and Technology (BMBF,1999). When establishment the teaching programme, taking into account the practical training, professional practical placement, and thesis outside the institute, and pay attention to increase the proportion of practice tache, reform the traditional teaching mode that theory and practice was carried out at different time and site, advocate theory teaching combined with experimentalizing. Emphasize the training nature of the teaching method, establish the skill training system for environmental engineering post when establishing the theory system for applying.

Take examination for the target to bring up synthetic qualified personnel

Test paper proposition should fully materialize the feature of higher vocational education that the speciality foundation knowledge is solid and the practice skill is perfect. The test grades can reflect the students' capability level as they really are.

PRACTICE OF HIGHER VOCATIONAL EDUCATION OF ENVIRONMENTAL ENGINEERING

Educational content

In addition to the theory and practice teaching content as above, it's important to carry out vocational moral teaching, which should carry through the whole learning process in order to bring up the persons that love the environmental protection career, with strong responsibility, at the same time, who are good at study and willing to innovate during working process.

Tutors procession

Tutors are the key to realize the teaching programme of higher vocational education. One side, we retain the even-tutors who are accomplished in theory and practice, in addition, we retain the careerman with abundance practice experience and high culture stuff as part-time tutors, in order to make teaching process press close to environmental working practice.

Teaching materials, media and simulation tool

Textbooks and other written text materials and exercises differ from those usual textbooks, which are revised according to the requirements of the higher vocational education of enhancing practical elements. In addition, these basics can be accompanied by supplementary material such as:

a)muti-media, organised such that it can be down-loaded from the Internet; b) slides, photos, videos; c) discussion forum/bulletin board etc.; d) real world project descriptions (cases); e) commercial program links/applications.

Practice site

The practice site at Tongji including:

• Relative production units having assigning co-operation agreement, which can supply practice and discipline site for students;

• Our institute has constituted "Shanghai city construction and administration practice center" (Xie, et al., 1999), the environmental pollution treatment practice room is being built now, which comprehensively embodies combination of mature technology, new technique and new research outcome, is a teaching and practice base having several functions of testing, practice and site simulation.

Professional practical training

The professional practical training of 4 months undertaken during the last semester is compulsory. Public and private institutions, engineering companies, administration, plant operation, consulting firms or authorities, i.e., in the same working areas as the professionals the students are going to join, are expected to employ the students for a nominal salary for practical training (Gujer,2000). We expect that the students will gain insight into the constraints of professional surroundings, will gain motivation for their studies and will improve their ability to get involved in experimental and field work in view of their final diploma thesis. Which is one possibility to make contact with potential employers and to make them aware of potential future human resources.

This period is supervised by a senior engineer, and it is individually followed up by a faculty member. Our tutors will maintain quality control and will assist the students to find reasonable training opportunities. At the end, the students have to prepare oral and written presentations about their work.

The enterprises participating who will employ higher vocational educational graduates

Be sure for cultivating the persons adapting to the front line of environmental protection, we should strive for the employment enterprises participating in and providing support during the whole process of education, such as specialty setting, teaching programme, curriculum content and teaching methods, including supplying teaching instruments, school running money and so on. The board and speciality supervise committee were organized in the Wuxi institute of Tongji University, in order to widely absorb the join of employ units, which achieves good effect.

SUMMARY

The goals of higher vocational education of environmental engineering at Tongji, are cultivating the technological and practical persons who have comprehensive vocational capability and can directly engage in production, service, technology, administration and operation of water supply, urban drainage, wastewater treatment, solid waste collection and handling systems on site. They differ from those academic and designing persons cultivated by usual discipline and teaching system, either differ from higher technology workers or technicians. The level the graduates work at is not meant to be highly advanced and scientific, but rather practical and applied.

The features of higher vocational education of environmental engineering are accordance with the educational goal. The graduates should have a number of skills which are not found in that combination in other engineering disciplines.

The teaching programme establishment and practice of higher vocational education of environmental engineering are determined by its features as above.

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THE USE OF A LABORATORY APPROACH FOR TEACHING ENGINEERING STUDENTS

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Keywords: Experimental research, laboratory based teaching; statistical analysis

Abstract: In this paper, the objective was to investigate the effectiveness of an alternative teaching method – lab-based teaching with a group of sub-degree students. A research experiment was designed, implemented and evaluated. The overall design for this experimental research is based on pretest-posttest model. In the design of this quasi-experiment, much effort was made to reduce the impacts of threats and practical constrains. Details teaching plan and delivery of the teaching are also discussed. At the end of the experiment, all students were examined on the module as part of their final year examination. This is the instrument used to collect students' attainment. Data analysis was carried out to investigate whether there are aspects of significant difference caused by the effect of the lab-based teaching. In conclusion, although there was greater improvement in attainment in the experimental group, it may be due to the initial difference of these two groups. Hence, there is no strong evidence that lab-based teaching is better than conventional teaching for cognitive learning.

1. OBJECTIVES OF THE RESEARCH

Teaching in a large lecture class seems to be successful in many higher education establishments[1,2]. Lectures with student size up to 100 are not uncommon. In this type of type of teaching, lecturers are the only people who do most of the talking in lectures. In fact, many students feel bored in this type of one-way communication. It was felt that some alternatives might be used to enhance the learning outcome of the students at Hong Kong Institute of Vocational Education (HKIVE) [3,4].

This study tries to achieve the following objectives:

1. To evaluate the effectiveness of lab-based teaching by carrying out a research experiment on two groups of students and study the difference of outcomes.
2. To determine whether lab-based teaching can be an alternative to conventional classes.
3. To identify any practical problems associated with lab-based teaching and suggest ways to tackle them.

2. METHODS AND TECHNIQUES

A research experiment was set up such that a group of students was divided into two sets. Half of the class took the traditional approach while the other half took the lab-based approach on an engineering module. The time-span of the experiment was one term (15 weeks). At the end of the experiment, all students were examined on the module as part of

their final year examination. This is the way the experimenter measured the student's attainment in that module. In addition to the examination, careful experimental design was done to assess the learning outcomes of students and evaluate the effect of the teaching of two different approaches.

The main emphasis in this paper is the design experimental research and its evaluation. This experiment is a useful approach for analysis the effectiveness of lab-based teaching.

3. OVERALL DESIGN PLAN

Multi-groups model is being one of the most robust techniques for the design of an education research. Due to the limited resources, researcher has to compromise in which he/she has to trade threats to practicality.

The overall design for this experimental research is based on pretest-posttest model. It is commonly used in educational research. Usually, the requirements of pretest and posttest model require initial randomized group. For administration requirement, quasi-experimental research was carried out without the initial random assignment.

In the design of this quasi-experiment, much effort was made to reduce the impacts of threats and practical constrains. In this experiment, 38 students had been grouped into two tutorials groups. Tutorial Group A had 18 students while Group B had 20 students. It was more convenient simply to carry out the experiment without re-grouping these students.

Because of the time-tabling constraint, it was decided Group A would have conventional teaching while Group B would go through the lab-based teaching. That is Group B is the experimental group while Group A is the control group (Table 1).

Tutorial Group	Group	Student Gp Size
A	Control Group	20
B	Experimental Group	18

Table 1: Grouping of the students

4. THREATS TO THE EXPERIMENTAL DESIGN

The overall design of the research consists of the following steps and it can be depicted in Figure 1. The pitfalls of the design come from the lack of initial randomization of participants to form two equal groups, that is, the two groups may not be equal before the experiment is implemented. The main threat to the design is the possibility that group differences on the posttest are due to initial differences rather than the treatment. In many education researches, it may not be possible to choose the "best" designs due to practical constraints. The quasi-experiment mentioned above seems to be the most "suitable" design. As will be shown in section 9, the technique of analysis of covariance is used to handle this problem.

	Time →	→	→
Group under investigation	T1	*X*	T2
Control Group	T1	*Y*	T2

Where T1 : pretest
T2 : posttest
X : lab-based teaching
Y : conventional teaching

Figure 1: Overall design methodology

Subsequently, the null hypothesis of the research is proposed - the mean examination score for students with lab-based teaching is equal to the mean examination score for students with conventional teaching. That is:

$$H_o : \mu_x = \mu_y$$

where H_o : the null hypothesis

μ_x : mean attainment score of students with treatment X (i.e. lab-based teaching)

μ_y : mean attainment score of students with treatment Y (i.e. conventional teaching)

The implementation of experiment can be summarized as the following steps in Table 2:

Step	Task	Details implementation
Step 1	Theory	Student attainment can be affected by different modes of teaching (dependent variable = teaching methodology independent variable = student attainment)
Step 2	Hypothesis	The hypothesis is defined with the characteristics "teaching methodology" with the level of attainment. When the level of attainment is understood to be unrelated to other factors, this can also decided their causal relationships.
Step 3	Main Operations	Experimental design – development of the quasi-experiment
		Delivery of both conventional and lab-based teaching to different groups of students
Step 4	Collect observation	Tabular the attainment score from pretest and posttest results from students' examinations.
Step 5	Data analysis	Apply data analysis techniques to investigate the relationship between the dependent and independent variable.
Step 6	Inference	Draw conclusions on the hypothesis from the data analysis. Examine the attainment level and change of attitude Infer possible causal cause-effect relationships.

***Table 2**: Summary of implementation of the experimental research*

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5. TEACHING PLAN

Once the experimental design framework had been set up, detailed teaching plans for the lab-based teaching were made to accommodate the delivery of syllabus based on the objectives of the module. The details can be shown in Table 3 with comparison of the conventional teaching and lab-based teaching.

Teaching Plan of conventional teaching class (for Control Group)	**Teaching Plan of the lab-based class (for Experimental Group)**
The following strategies that should be used in teaching conventional class (Lecture) The use of conventional lecture The use of tutorial style for helping student to dissimulate and solve problem The following strategies that should be used in teaching conventional laboratory class. These were the normal standard practice for laboratory. Emphasis of skill based learning in which students learn the basic skills for equipment operation that re-enforcement of theory.	The following strategies that should be used in teaching lab-based class The use of discovery teaching tactics The including of problem solving activities within the laboratories Emphasis of student involvement in open-ended laboratory exercises The laboratory is divided into many laboratory sessions that cover all the topics mentioned in the syllabus. For each laboratory, it is followed by exercises. This can reinforce a particular concept. Coverage of the related theory is provided leading up to each exercise. Unlike the conventional procedure used in lecture, the students are expected to learn the theory intuitively.

***Table 3**: Comparison of teaching strategies between conventional and lab-based teaching*

6. DELIVERY OF THE TEACHING

After careful study, the module entitled "Discrete-time Signal Processing" (DSP) was chosen. The module is a third-level course for students of Higher Diploma in Communications Engineering. Before the commencement of the research experiment, a series of lab-based teaching materials were prepared [5,6]. Many efforts were made to ensure teaching is relevant and the attainment is comparable to that of conventional teaching. In the design of the laboratory teaching, the ethical issues have been considered. It is hoped that the impact can be reduced in case lab-based teaching proved to be a failure.

Table 4 shown below compares the teaching plan of conventional and lab-based teaching. It is noticed that the amount of contact hours of these two methods is comparable.

Teaching plan of the conventional class		Teaching plan of the lab-based class	
The teaching plan to satisfy the above syllabus is as follows:		The teaching plan to satisfy the syllabus is as follows :	
2-hour lectures	x 8	3-hour laboratory-based class	x 8
2-hour tutorials (for a short test, and revision before examination)	x 2	2-hour tutorials (for a short test, and revision before examination)	x 2
3-hour laboratory	x 3		
Total	29 hours	Total	28 hours
• Each of the lectures is covered in lecture room. The teaching consists of • 15 mins of reviews of topics covered in last sections • 20-30 mins to cover the each of the main topics • Re-enforcement of the topics by solved examples. • Conclusion at the last 5 mins.		• The integrated lab-based teaching consists of • 15 mins of reviews of topics covered in the last sections • 20-30 mins of introductory topics and overview of the difficult concepts that • Allow time for students for laboratory exploration using computer. • At the last 15 mins, short quiz to probe student understanding of the topics.	

Table 4: Comparison of overall teaching plan of teaching sessions of the two methods

7. MEASUREMENT OF THE COGNITIVE OUTCOMES - PRETEST AND POSTTEST

In this experimental research, students' examination results were used as their pretest and posttest scores. Although it is very difficult to have reliable pretest score that can exactly identify students' attainment before the commencing the experiment, it is necessary that we have to make the assumption the pretest is valid and it can produce a set of reliable data.

Precaution has been made to alleviate the possible problems. The pretest score can be obtained from results of the pre-requisites unit "Signal in Systems". It was the examination result of students in their 2nd year. There are many factors that can affect the reliability of this data after 8 months. It was later decided the pretest score was extracted from the examination result another module "Information Systems" taught by the author. Although the result from this examination cannot guarantee the pretest is actually measuring the learning attainment in the experiment module, it does certainly reflect the students' general ability to comprehend technical content in a related area.

At the end of the experiment, posttest was designed to measure the cognitive outcome. Since all students were examined on the module as part of their final year examination, the examination score is used as posttest result. It is a natural choice as the examination supposes to measure students' attainment of the module. To moderate the validity of the instrument to measure posttest result, the examination paper had gone through the normal procedures of internal and external moderation within the EE department.

8. ANALYSIS OF STUDENT'S COGNITIVE OUTCOMES

Data shown in the following tables indicate the elementary result of students' cognitive outcomes. Table 5 is the descriptive statistics of the module "Information System". This is a

technical module taught in the first term (i.e. before the experiment). Note that the only the examination result was used as the pretest score. Data in Table 6 shows the continuous assessment and examination result of module "Digital Signal Processing". Again, the examination score is used as to measure students' attainment. The posttest result show the average attainment score of students in Group B (experiment group) is 55.5% while it is only 50.2% for students in Group A (control group). Note that also the pretest result (average) of Group B is 57.1% which is slightly higher the average score of Group A (54.5%).

Unit code : EE315	**Group A – control group**		**Group B – experiment group**	
Title : Information systems	Average	Standard Deviation	Average	Standard Deviation
EXAM (pre-test)	**53.7**	**8.8**	**61.1**	**6.2**
CA	52.8	11.5	62.1	9.0
Total	54.5	5.9	57.1	5.5

***Table 5**: Descriptive statistics of pretest score*

Unit code : EE351	**Group A – control group**		**Group B – experiment group**	
Title : DSP	Average	Standard Deviation	Average	Standard Deviation
EXAM (post-test)	**50.2**	**13**	**55.5**	**12**
CA	48.0	9	51.0	9
Total	49.5	11	54.2	11

***Table 6**: Descriptive statistics of posttest score*

From the descriptive statistical data shown Table 6, one can say Group B (55.5 marks) is better than Group A (50.2 marks) after the experimental treatment. There are many possible reasons that can cause students with such better learning attainment. Reasons such as statistical variations, initial difference of the groups, experiment treatment cannot be ruled out. It is necessary to carry out further data analysis to examine the causes of the difference. The data are evaluated using Statistical Package for Social Science (SPSS)[7,8].

The computer printout of Figure 2 shows the posttest results of the two groups of students; these are Group 3 (control group) and Group 4 (experiment group). The next part of the output shows the *t*-test itself. It shows that the group sizes and the groups had comparable means (i.e. 50.2778 and 55.4500 respectively). The standard deviation is 13.38 and 12.12 respectively. Using the pooled variance estimate, the *t*-value is –1.25. The negative sign arises simply because of the order of listing the groups and is not of itself of any significance. The *t*-value is 1.25 and it has a probability of 0.219. That is the probability of these set of data are drawn from the same population is 0.219. We can say it is likely that the difference of the mean of these two groups (i.e. 50.2778 and 55.4500) is due to statistical variation. From the initial analysis, the null hypothesis H_o is **accepted**.

$$H_o : \mu_x = \mu_y$$

Where H_o : the null hypothesis

μ_x : mean attainment score of students with treatment *X* (i.e. lab-based teaching)

μ_y : mean attainment score of students with treatment *Y* (i.e. conventional teaching)

t-tests for independent samples of GP

Variable	Number of Cases	Mean	SD	SE of Mean
EXAM (posttest)				
GP 3 (control)	18	50.2778	13.389	3.156
GP 4 (experiment)	20	55.4500	12.120	2.710

Mean Difference = -5.1722

Levene's Test for Equality of Variances: F= .003 P= .956

Variances	t-value	df	2-Tail Sig	SE of Diff	95% CI for Diff
Equal	-1.25	36	.219	4.138	(-13.565, 3.221)
Unequal	-1.24	34.52	.222	4.160	(-13.619, 3.275)

***Figure 2** : Data analysis using SPSS – t-test of posttest result*

Figure 3 shows pretest results of the two groups of students; these are Group 1 (control group) and Group 3 (experiment group). The next part of the output shows the *t*-test itself. It shows that the groups had the means 53.7222 and 61.0500 respectively. Again, using the pooled variance estimate, the t-value is 2.99. It has a probability of 0.005. That is to say it is unlikely (0.5%) these samples are drawn from the same population. We can conclude these two groups were not initially equal. It is necessary to carry out further analysis to take into consideration of un-equal groupings.

t-tests for independent samples of GP

Variable	Number of Cases	Mean	SD	SE of Mean
EXAM - pretest				
GP 1 (control)	18	53.7222	8.837	2.083
GP 2 (experiment)	20	61.0500	6.160	1.377

Mean Difference = -7.3278

Levene's Test for Equality of Variances: F= 2.107 P= .155

Variances	t-value	df	2-Tail Sig	SE of Diff	95% CI for Diff
Equal	-2.99	36	.005	2.451	(-12.299, -2.356)
Unequal	-2.93	29.99	.006	2.497	(-12.429, -2.227)

***Figure 3** : Data analysis using SPSS – t-test for the pretest result. (note that there is initial difference between two group of student before experiment)*

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9. ANALYSIS OF COVARIANCE

Data analysis shown in Section 8 indicates the initial grouping (not random assignment) does not produce groups with equal pretest means. It is not the deficiency of the design of the experiment. In many cases, random allocation does not guarantee it produces equal groups at the start especially if group size is small.

As shown in section 8, *t*-test is useful to find whether the means of two groups differed significantly. But it is also necessary to compare the difference of pre-test and post-test score of two different groups of students. *Analysis of variance* is useful as it takes consideration of initial difference. The one-factor analysis of variance (ANOVA) procedures is used because there is just one independent variable and one dependent variable. Details of the analysis is shown in Figure 4.

```
Variable  EXAM
   By Variable  GROUP

- - - - -  O N E W A Y  - - - - -

      Variable  EXAM
   By Variable  GP     (1=pretest-control; 2=pretest-experimental;
                        3=posttest-control; 4=posttest-experimental)

                              Analysis of Variance


                                    Sum of          Mean            F      F
       Source                D.F.   Squares         Squares         Ratio  Prob.

Between Groups                 3     1160.5094       386.8365       3.5314  .0190
Within Groups                 72     7887.1222       109.5434
Total                         75     9047.6316
```

***Figure 4**: Data analysis using SPSS – analysis of variance for four groups*

The first part of the computer printout shows an *F*-test on the data. The *F*-ratio, the ratio between groups is 3.5314 with low associated probability (0.019). This is the low probability indicates that it is unlikely that the groups come from the same population.

In order to determine the effect of each of the variables and their joint effect on achievement of students, and analysis of variance was used which is shown in Figure 5.

```
* * * A N A L Y S I S   O F   V A R I A N C E * * *

           POSTEXAM
     by    GP          (1 = control; 2= experimental)
     with  PREEXAM

           UNIQUE sums of squares
           All effects entered simultaneously
```

Source of Variation	Sum of Squares	DF	Mean Square	F	Sig of F
Covariates	1306.427	1	1306.427	10.089	.003
PREEXAM	1306.427	1	1306.427	10.089	.003
Main Effects	3.505	1	3.505	.027	.870
GP	3.505	1	3.505	.027	.870
Explained	1559.866	2	779.933	6.023	.006
Residual	4532.134	35	129.490		
Total	6092.000	37	164.649		

```
38 cases were processed.
0 cases (.0 pct) were missing.
```

Figure 5 : Data analysis using SPSS – analysis of variance for2 groups (with pretest scores as the covariates)

The output shows a fairly high F-ratio 10.089 with a significance value of 0.003 for pre-exam score differences between the groups. It is highly unlikely ($p < 0.003$)that the groups of students were equal at the start of the research experiment. The next part of the output shows an F-ratio of 0.027 ($p < 0.87$) for the effects of teaching group on the posttest scores after correction for unequal value of pre-test. That is, after correction, the two teaching methods (conventional and lab-based) were statistically equal (i.e. 87%). As far as cognitive outcome is concern, with the consideration of unequal pretest score, the null hypothesis ($H_o : \mu_x = \mu_y$) is **accepted**.

10 SUMMARY

In this investigation, an experimental research was implemented to evaluate the effectiveness of lab-based teaching with respect to conventional teaching. The design for this research experiment is the "grouping-pretest-treatment-posttest" method. The different teaching methods were implemented using a one-term module known as "Digital Signal Processing". The implementation of the syllabus was completed using these two different teaching approaches.

During the experiment, measurements of students' attainment and attitude are collected. Data analysis was carried out to investigate whether there are aspects of significant difference caused by the effect of the lab-based teaching. Although there was greater improvement in attainment in the experimental group, it may be due to the initial difference of these two groups. Hence, it is concluded that there is **no strong** evidence that lab-based teaching is better than conventional teaching for cognitive learning. The data analysis of students' attitude also indicates there is no evidence that the change in students' perception is the result of the lab-based teaching.

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THE PRACTICE FIRM CONCEPT
– A COMPETENCY APPROACH TO TEACH KEY BUSINESS SKILLS

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Index: Action-learning, Assessment, Business, Competency-based, Employability, Simulation

Abstract: Whether it is called "Core Skills (UK)"; "Employability Skills (Canada)"; "Essential Skills (New Zealand)"; "Workplace Know-how (USA)" or "Project and Transfer Oriented Training (Germany)", globally we have been concerned with integrating key competencies with learning outcomes to provide the workforce with potential employees that are employable in day one. The Department of Business Administration, HKIVE (Tsing Yi) supports this view by incorporating "the Practice Firm Concept" into course delivery, with the belief that it enhances the quality of teaching and fosters life-long learning skills. The purpose of this paper is to illustrate how this Concept has been developed and incorporated in our business curriculum.

BACKGROUND

On a fact-finding tour to Australia in November, 1998, the Department of Business Administration, IVE (Tsing Yi) came across an innovative teaching and learning approach in business education called the "Practice Firm" Concept which blends practical work experience with theoretical learning. The Department has incorporated this approach into its final-year project because of its value as a stepping stone between classroom learning and the real world of business.

As part fulfillment of the Higher Diploma curriculum, our final-year students are required to undertake a group project in the final year and to submit a collective report on group effort. This project is an important learning activity, which serves as the integrative vehicle of the different components of the course. It has several educational functions regardless of the kind of work that students will enter into after graduation.

1. It provides a practical learning experience in which students can integrate and apply their knowledge with emphasis on solving practical business problems using the skills and knowledge acquired from different sources and disciplines.
2. It provides preliminary training for those students who intend to pursue further studies. This involves not only the implementation of research methods but also the ability to learn to manage a project in an independent manner.
3. If the student does not intend to pursue further studies, the skills acquired in project work will be valuable in all kinds of independent investigation and report writing in the workplace.

WHAT IS A PRACTICE FIRM?

A Practice Firm is a simulated business that is set up and run by students with the support from a teacher trained in facilitation techniques and a Mentor Organization (called the Business Partner Firm). The students buy and sell products or services on a local, national or international basis among practice firms within a closed market economy.

The products and/or services offered by the Practice Firm reflect those marketed by the Business Partner Firm. Although there is no actual transfer of goods or money, all the usual business transactions involved in setting up and running a practice firm needs to be considered:

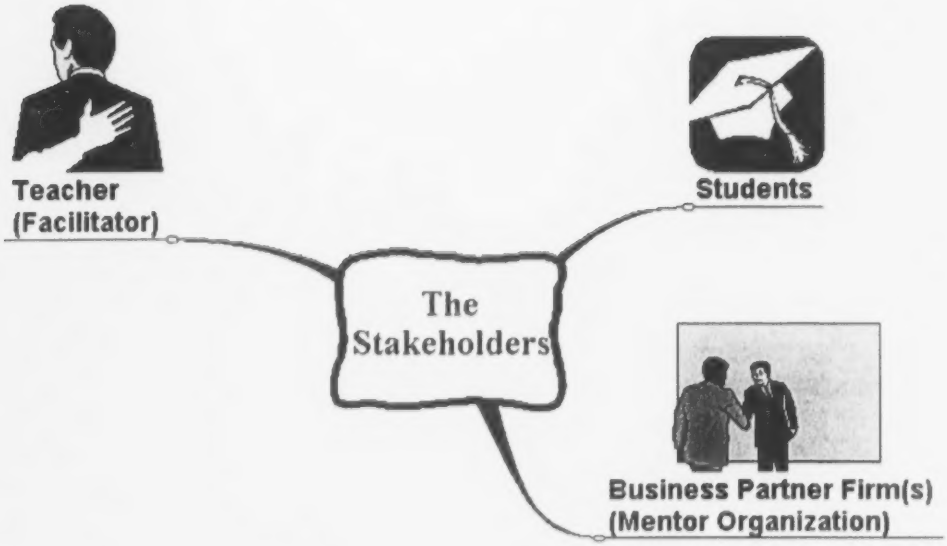
- writing a business/departmental plan;
- identifying the range of products/services;
- producing a price catalogue/list;
- selecting/enhancing a business name;
- designing/enhancing a business logo;
- drafting/enhancing a mission statement;
- designing an organizational structure that would suit your practice firm;
- form departments by identifying appropriate business functions within the simulated business, e.g., maintaining financial records, preparing a budget, market research, human resources management, marketing; and
- other business activities.

Practice Firms can be established in any line of business. At present, the HKNPF has seven businesses, they are

Creative Era	Creative Era Public Relations Company (Public Relations & Event Management)
YKPF	Yau Kee Transportation Co. Ltd. (Local Transportation Service)
Bha	Brilliant Hair Accessory Co. Ltd. (Wholesale Retailing)
Ex	ExSpeed Logistics Co. Ltd. (Consumer Logistics Service)
DINO	DINO Co. Ltd. (Retail - Purchasing & Logistics)
TIPS	Tips Computer Co. (Computer Retail, Assembly & Maintenance)
	Sonic Printing Group (Printing)

Like any economy, diversity is encouraged.

THE STAKEHOLDERS



The Students

Students become "employees" of the Practice Firm and they work within legal guidelines and other regulations that are imposed on a real firm, such as those relating to company registration, copyright, occupational health and safety, equal opportunity matters, etc. This provides opportunities for students to experience realistic business activities and develop problem-solving and decision-making skills in a variety of business situations.

Students are encouraged to plan, research, develop and trial a range of procedures and processes. They reflect on the content and nature of their learning through this hands-on approach with guidance from the teacher. They work in teams to develop their interpersonal skills. They also learn to solve problems and take ownership of both mistakes and successes.

The Practice Firm is a learning environment that is managed by the students. This is how they learn best about business – by doing it! They learn about what they need to do to keep the business running. They gain skills in managing the business while they are also learning how to learn. The experiences in a Practice Firm will help students to learn about their own skills and interests, and give them confidence in planning a career path.

The Business Partner Firm

(Mentor Organization)

A relationship with a Business Partner Firm, a real business, is developed to keep the Practice Firm in touch with the real economy and real business processes. The Business Partner Firm acts as a mentor for the Practice Firm and provides advice and support to students.

Students may have established an arrangement with the Business Partner Firm that includes

- using the business partner firm's products and/or services for simulated trading purposes and promotion within the practice firm networks;
- visiting the business partner firm's business site;
- providing business information , e.g., procedural manuals, policies, etc.;
- providing industry placements; etc.

The Teacher
(Facilitator)

Real work environments do not have theory sessions so lecturing or teaching activities do not fit in the simulated workplace! Teachers adopt the role of "facilitators" by guiding, mentoring, suggesting and coaching students in their work.

RATIONALE FOR THE PRACTICE FIRM CONCEPT

Hong Kong Network of Practice Firms
(http://www.hknpf.vtc.edu.hk)

In order to prepare students for working effectively in the 21st century, the learning environment must replicate the workplace in its use of technology, work arrangements and business goals. The Hong Kong Network of Practice Firms (HKNPF), which is located within our Department, plans to implement e-commerce principles to ensure that students are familiar with up-to-date business processes and test the implications of on-line internet-based business operations.

In this near-real workplace environment, students can acquire and develop skills (adapting to changing demands of the job, carrying responsibility, work attitudes, etc.) that are otherwise not possible in the traditional classroom. One only needs to browse through the Classified Section of newspapers or job search web sites to be convinced of the importance of the personal characteristics and attitudes desired by employers.

CONCLUSIONS

The Practice Firm Concept provides an action-learning environment whereby

- students can acquire employability skills while pursuing a specialized field of study which in turn enhances their employment prospects;
- a framework is established between the business community and educational institutions so that they can exert mutual influence over what employers wants in their prospective employees and what schools and colleges need to be incorporating in the curriculum;
- teachers are made aware of the need to revise their teaching and learning strategies that will help students to acquire employability skills such as positive work attitudes, good work habits, practice ethical behaviors, accept responsibility, and working with others; and
- academic and technical excellence is "generally useless if they cannot be coupled with the employability skills necessary to survive in the business world." (Wentling, 1987:316)

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BENCHMARKING IN SUPPLY CHAIN MANAGEMENT: A PROCESS TO FIND A BETTER WAY, RATHER THAN AN ATTEMPT TO REINVENT THE PROVERBIAL WHEEL

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Index: Benchmarking, Organisation Learning, Supply Chain Management

Abstract: In searching for "best practices" in Supply Chain Management, the Asian Benchmarking Clearinghouse (ABC) of Hong Kong Productivity Council (HKPC), jointly with Hong Kong Article Numbering Association (HKANA), conducted a consortium benchmarking study.

Through systematic data collection and site visit processes, the consortium group gained critical insights into key issues, challenges and solutions. More importantly, the participated companies were able to identify their positions in the marketplace that were essential for goal setting and attaining superior performance.

The Hong Kong Productivity Council shares a same benchmarking methodology with its global alliance partner, American Productivity and Quality Center (APQC). The approach was developed in 1993 and has been serving as one of the premier methods for successful benchmarking in the world.

I INTRODUCTION

Benchmarking is a process of improving performance by continuously identifying, understanding, and adapting outstanding practices and processes found inside and outside the organization. Many Fortune 500 companies and other large organizations have embraced benchmarking as an important, systematic methodology for achieving the organization's strategic objectives.

A 1995 research study conducted by the American Productivity & Quality Center's (APQC) International Benchmarking Clearinghouse demonstrated benchmarking's tremendous leverage. More than 30 organizations reported an average US$76 million first-year payback from their most successful benchmarking project. Among the most experienced benchmarkers, the average payback soared to US$189 million.

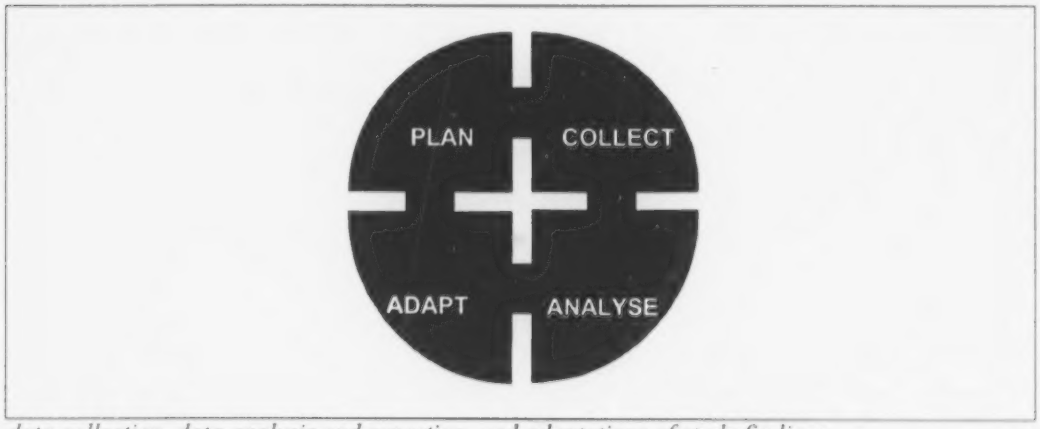
Benchmarking's positive influence extends beyond improving a particular business process. It also promotes the emergence and evolution of a "learning culture" throughout the enterprise-a key to continuous improvement, total quality, and competitiveness over the long term.

II BENCHMARKING METHODOLOGY

The Hong Kong Productivity Council shares a same benchmarking methodology with its global alliance partner, American Productivity and Quality Center (APQC). The approach was developed in 1993 and has been serving as one of the premier methods for successful benchmarking in the world.

HKPC uses a four-phased approach in conducting consortium benchmarking study, i.e. planning, data collection, data analysis and reporting, and adaptations of study findings.

Figure 1: HKPC's consortium benchmarking studies use a four-phased approach: study planning, data collection, data analysis and reporting, and adaptations of study findings



Plan

During this phase the specific study focus area, key measures and definitions are established and clearly documented. Additionally, the data collection tools are refined and finalized, and research is conducted to identify the best-practice organizations to study.

Collect

This phase has two distinct objectives: 1) collect qualitative data, and 2) learn from the best. The study questionnaire is administered to all participants, and the site visits are conducted at selected best-practice organizations.

For sits visits, best practice partners receive the list of questions to be asked prior to the site visit to ensure a smooth, productive, and efficient learning experience. Participants can send a representative to at least two site visits, where both qualitative and quantitative information is collected. Participants receive a report from each site visit, whether they attend or not.

Analyse

Key activities during this phase include analyzing trends and identifying practices that enable and hinder superior performance. The study team presents a final report containing key findings and insights at a Knowledge Transfer Session. At this concluding meeting of the study, the sponsors discuss the key findings in depth and have an opportunity to interact with each other and the best-practice organizations through systematic networking activities and presentations. The study team facilitates participants' initial action plan development to adapt and implement what they have learned.

Adapt

Adaptation and improvement resulting from the best practices identified throughout a consortium study occur after the study participants take the learnings back to their organizations.

III BENCHMARKING INTO ACTION

Due to the emerge of new information technologies, globalization of operations and markets, increasing pressure from customers on responsiveness and reliability, Supply Chain Management (SCM) has become at once a challenge and an opportunity. In view of Supply Chain Management has become one of the core competitive advantages for many companies, the Asian Benchmarking Clearinghouse (ABC) of the Hong Kong Productivity Council (HKPC) jointly with the Hong Kong Article Numbering Association (HKANA) conducted a Supply Chain Management benchmarking consortium study in 1999.

. This process resulted in the compilation of a list of site visit candidates. Each site visit candidate was contacted and asked to participate in a screening interview. Based on the results of the interview,

as well as company availability, the HKPC study team confirmed site visits with eight candidates.

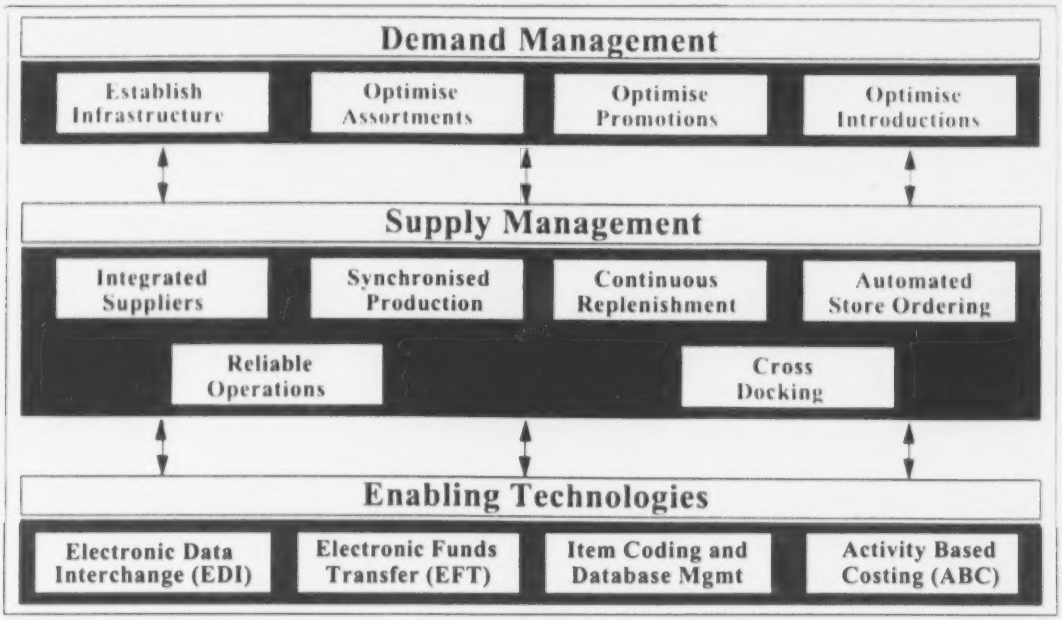
Phase 2: Collect

The HKPC study team collected data from the "best practice partners" and participating companies via two separate data collection tools:

i) *Detailed Questionnaire:* quantitative questions designed to collect objective and quantitative data.

The first part of the detailed questionnaire was based on the questionnaire used in the Global Logistic Research Project of the Michigan State University. The second part of the questionnaire was structured around 10 supply chain improvement concepts which were grouped under 2 focus areas: Supply Management and Enabling Technologies.

Figure 2: Supply chain improvement concepts (Source: The Official Supply Chain Management

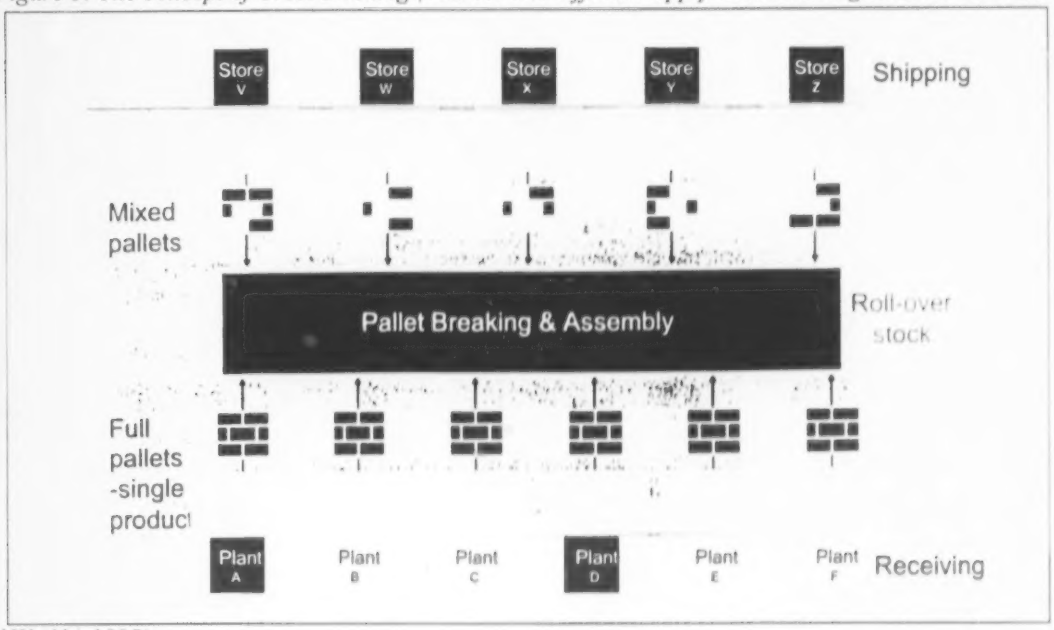


Scorecard, HKANA 1998)

For each improvement concept, participants were asked to self assess their current practices by using a scorecard.

For example, the target of Cross Docking is to eliminate non-productive inventory held at retailer and wholesaler Distribution Centres (DCs). By eliminating storing of products at retailer DCs, the merchandise received at the warehouse or DC is not put away, but turned around for shipment to retail stores, typically with 24 hours. Benefits stem from reducing time and cost to move products into and out of warehouse locations, including associated data entries into inventory management information systems.

Figure 3: The concept of Cross Docking (Source: The Official Supply Chain Management Scorecard,



HKANA 1998)

By using the scorecard, the participants assessed their maturity level on two aspects: (1) Assessment, i.e. the ability determine whether cross docking/flow through should be carried out and if so which sort of cross docking/flow through is appropriate for the category and supply chain under consideration); (2) Implementation, i.e. the transfer of inward deliveries of any kind from the zone of reception directly to the zone of delivery with only limited or no interim storage at all).

The results of this study revealed that the consortium group made significant efforts on both self-evaluation and trial implementation, with at least few selected suppliers. However, a large-scale implementation was limited in Hong Kong.

ii) Site Visit Discussion Guide: qualitative questions designed to collect qualitative information about targeted aspects of supply chain management. To collect these data, the best practice partners offered half-day "site visits," allowing participants to meet with them and share their implementation practices.

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Figure 4: Cross Docking in a US best practice partner's site

Phase 3: Analyse

The HKPC study team analysed both the quantitative and qualitative information gained from using the data collection tools. The analysis focused on identifying innovative practices and methodologies for Supply Chain Management implementation. Analysis of participants' data formed the basis of the final report.

Phase 4: Adapt

In January 2000, the HKPC and HKANA study team presented key findings of the study to both sponsors and partners of this initiative. All participating organizations received a copy of the final report, which showcased critical success factors identified through the research and site visit processes. Participants use this report to begin adapting the use of successful implementation strategies within their organizations.

IV CONCLUDING REMARKS

Through a systematic data collection process and site visits, the SCM consortium group in Hong Kong gained critical insights into key issues, challenges and solutions. More importantly, they were able to identify their positions in the marketplace that were essential for goal setting and attaining superior performance.

The project has clearly demonstrated Benchmarking is a powerful tool for identifying best and innovative practices and for facilitating the actual transfer of these practices. It also shows that Benchmarking is a positive, proactive, structured process that leads to changing operations and eventually attaining superior performance and a competitive advantage.

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VOCATIONAL EDUCATION AND TRAINING FOR HONG KONG INTO THE 21ST CENTURY : AN INVESTIGATIVE REPORT

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Abstract: Demands from the 21st century customers will change fundamentally from that of past years. This article attempts to review the traditional strength of Hong Kong economy and its people's ability to meet with these new demands. Vocational Education and Training plays an important role in the provision of human resources. In this article the concept and methodology for "Shaping the 21st century worker" is proposed. The main issue being investigated is to provide workers with knowledge and ability, not just to cope with skills and knowledge require for their related field of work, but also the ability to control their work organization and to shape and design new methods / processes for new generations of products and services. Occupational-related didactics, alongside with their methodological implications and applications are also investigated. It is proposed that project based learning type of education and training are needed to be developed and implemented for various "professional profiles". The requirements of the new age VET trainer to suit the changing needs of service / industry are also discussed.

An initial investigative report.

1. INTRODUCTION

Over the past two decades, especially in the western world, the development of technology in the transformation of materials into consumable products and service has been rapid. As a result great wealth has been created, the average people in the western world owns much more than their predecessors. It is a social norm that when peoples' basic needs are satisfied then their aspiration to satisfy their ego needs will increase. Thus product functional quality alone will not be enough, product variability and fashion have become extra dimensions in their quest for products to be consumed. This consumer led phenomenon reflects the demand on the modern manufacturing and service industry as a whole. Product quality and reliability, product variability, short product life cycle, product availability on short notice and at the right cost are all necessary characteristics of a desirable consumable product. As a result the traditional system of mass production and monotonous type of service with adequate functional quality and lowest production costs is no longer compatible to current consumer demands. Modern system that incorporates production and service of high variety, quality to customers' specification and flexibility of switching product types almost instantaneously are required. On top of this there is also the factor of cost. Although the lowest cost to the consumer is not necessary the most desirable factor in a consumable product, however the lowest production cost will allow a much higher degree of pricing flexibility and the possibility of a higher profit margin. This important factor has become indispensable in an increasingly competitive commercial market for desirable consumable products.

Development of Hong Kong Manufacturing and Service Industry.

The strategic location of Hong Kong in the Pearl River Delta and the post Second World War years of political and economical turmoil in mainland China contributes greatly to the rapid development of manufacturing industry in Hong Kong. Until 1987 the local manufacturing industries are the biggest contributor to the Hong Kong GDP.

Since the creation of special economic zones in Shenzhen and Zhuhai by the Peoples' Republic of China, many local manufacturing industries have started to move most of their production processes to these areas and the surrounding townships. The main reasons are to enjoy conditions such as cheap labour costs, special tax relief and much less stringent regulations in pollution control, fire prevention and industrial safety. What is left behind are functions such as procurement of materials, sales and marketing, design and product development, technical support, production planning and control, quality control, packaging and logistics.

Manufacturing and service industries in Hong Kong are now facing increasing competition from other developed and developing countries. The emergence of new market environment requires products and services not only of high quality, but also with much higher degree of variety and ever reducing product life cycle. Thus the ability to design innovatively, to manufacture and provide products / services flexibly and speedily with very low level of inventory will be of paramount importance. Hong Kong industries have to gradually adapt changes from its traditionally labour-intensive operations to update and upgraded their technology and management techniques.

Meanwhile manufacturers in mainland China will continue to develop, whilst utilizing its abundant resources in terms of labour, land and materials, there is still a lot of room for improvement on areas such as technical support services, manufacturing management and administration. The performance of the economies of Hong Kong and Southern China is so intertwined that it would be unrealistic to do planning without taking into account of the other. With Hong Kong revert to Chinese sovereignty in 1997, it is apparent that both service and manufacturing industries of both regions are starting to co-operate and grow, gradually integrate and merge as one. To sustain such continuous growth of the combined economies, there will be substantial demand for technical support in providing the technological know-how.

The objectives identified by the "Made by Hong Kong" report (Berger et al 1997) does bear considerable significance as guidelines for future Hong Kong industrial development.

That is -

1. Transformation of current production system by identifying the best practices of good companies as well as targeting the strengths and weaknesses of a system as a whole.
2. Concentrate not only at high technology industries (e.g. biotechnology, information technology, and electronics), but also at core industries, by understand how new products combining manufacturing skills and services to create new form of industries.
3. Investigate the emergence of new generations of products that tightly link services and manufacturing goods, which includes information technology.

The same report carries on to point out that if the above objectives are to be realized, human resource in Hong Kong will need to be developed. The following areas will need to be addressed with detail analysis, evaluation, planning and implementation of planned actions:

- Overcome the widespread lack of commitment to the development of human resources at all levels of Hong Kong industry.
- Upgrading the competency of English language.
- Develop new capabilities for product and process innovation and design, including engineering and management with the ability to work as a team, creating and designing new products, processes and systems.

- **Develop new breed of personnel capable of operate effectively beyond a single discipline and to combine deep knowledge of science and engineering fundamentals with practical, real-world knowledge and hands-on experience**.

Strengths of Hong Kong Manufacturing / Service Industries.

The uniqueness of Hong Kong geographical and political location has greatly influenced the culture of its industries and workforce. From the early days of British colonial governorship to today autonomic rule under Chinese sovereignty, the Hong Kong economy is continuously influenced by outside political and economical factors. Face with no natural resources of its own, Hong Kong continue to prosper, utilizing its only assets, its geographical location and its people. It is true to argue that Hong Kong has a good economic infrastructure and a huge reserve in the Treasury, which it can buy itself out of any economic crisis. This may be true over the short-term period. One only has to look at Japan economy and you will soon realize that economic problem lies more closely with its people, or rather, the culture and capability of its people. Upon close scrutiny Hong Kong industrial strength lies with its huge reservoir of multi-talented entrepreneurial human resources. The "Made by Hong Kong" report (Berger et al 1997) again identifies and summarizes the strength of Hong Kong industrial workforce as follows:

1. Flexibility in production according to customers' diverse needs - ability to detect changes in trend and to respond with new products, the ability to get goods to customers quickly, the ability on the shop floor to work on many different products at the same time and to switch lines rapidly from one product to another.
2. Coordination - Managers who are capable to master the complex problems of production in territories with relatively lesser industrial experience and complicate political environment. Hong Kong managers are with multifaceted skills: education in engineering and science in HK and abroad, years of work in HK plants with skilled workforce, multiple close contacts with demanding and sophisticated buyers in HK and abroad, experience in international markets, and job rotation through a number of HK companies, across different parts of the industry, collaboration in production with workers who have long experience and skills to rapid learning, operate effectively in the absence of a stable workforce, coordinate the factory and produce consistent result in quality and productivity.
3. Political framework - rule of law, limited government, the protection of individual rights, freedom of information and association that created a public environment that supports economic growth and innovation, is open and secure for foreign investors. Low tax regime, good transportation and telecommunication infrastructure, relative comprehensive education and cheap medical services, public housing program that supplies low cost housing. All these effectively subsidize the cost of industrialization.
4. Internationalism - the ability to understand, interprets and translates into specific and diverse customers' requirements. Large communities of foreign nationals, significant presence of European, Japanese and USA Corporation's regional headquarters and offices, and Hong Kong people bilingualism.

Weakness of human resources development in Hong Kong.

Up until now most Hong Kong manufacturing and service companies tends to resolve problems as it arises, to seize upon manufacturing opportunities and to invest the minimum amount so as to obtain the largest possible margin on the return of their investment.

Troubleshooting, crisis management etc., forms a necessary and important part of the techniques processed by management and technical personnel of the manufacturing industries. Uncoordinated piecemeal approach to resolve problems seems to be the order of the day. This is particularly true for the majority of the medium size of manufacturing companies in Hong Kong.

Upon close examination of this type of approach, at best it can still cope with shorter term of demand of low cost, high quantity type of products and with considerably high wastage of human and materials resources. But for longer term this type of approach is simply inadequate to respond to modern market demands.

If the Hong Kong manufacturing industry in general still adopts this type of approach and explains it to themselves that it is their blend of flexibility and adaptability, then it poses a big question mark on the capability of the industry as a whole to cope with the demands of consumers of today and tomorrow.

2. HUMAN RESOURCE DEVELOPMENT IN HONG KONG

Despite the tremendous growth in prosperity over the last decade in Hong Kong, the number of skilled and semi-skilled positions in Hong Kong has been declining rapidly since the mid-1980s, but the demand of managerial staff, engineers, technicians and other skilled workers has continued to rise (Federation of Hong Kong Industries survey 1995). The fall of skilled and semi-skilled positions can be explained by the fact that most industries have been relocating their manufacturing operations across the border to Chinese mainland, where land, materials and human resources are much more cost efficient. However the trend of rising demand of technical and managerial staff has created shortage of qualified engineering and managerial professionals.

There were comments (Federation of Hong Kong Industries survey 1995) made to suggest that Hong Kong higher educational institutions do not tailor their teaching and research activities closely enough to industries' needs and that local graduates are weakest in the area of management and human relation skills, lack of practical knowledge. All employers expressed strong preference of North American and European University graduates to local graduates. The difference being the broader and more practical experience and knowledge and the extra edge in creativity and initiative. Thus the narrowness of education received by current higher education graduates, lack of general management skills need to be replaced by new capabilities not just for management and finance, but also includes a thorough understanding of basic technological concepts of product / process innovation and design, with the ability to work as a team, creating and designing new products, services, and its relevant processes and systems. What is required is as the "Made by Hong Kong" suggests, a new breed of personnel capable have operate effectively beyond a single discipline and to combine deep knowledge of science and engineering fundamentals with practical, real-world knowledge and hands-on experience.

3. VOCATIONAL TRAINING SYSTEM IN HONG KONG has undergone a major review in 1997, apart from reorganization of the Vocational Training Council management and organizational structure; it also recommends focus on strengthening the role of employers in the design of training strategies for different sectors of the economy. Flexible and vibrant vocational training system is desperately needed for Hong Kong to realize its aspirations for knowledge intensive, high value added economic growth.

This has led to increasing attention being paid to initial and continuing vocational education and training. The Vocational Training Council in Hong Kong has embarked on ambitious programs of reform to ensure a supply of skilled labour for industry and commerce. Their objectives are clear, that is to provide technical education and training to meet the changing demands of the economy with high degree of flexibility and

responsiveness. Their overall strategy is to review their resource deployment, quality of work and efficiency of all the operating units, to enhance their information infrastructure and to identify a new methodology so that improved labour market analysis can be carried out, allowing the re-deployment of their resources according to social demand. (Lee 1997)

But it is clear that current processes of planning and implementation of initial and vocational education do not prepare workers for the new work activities. Analysis of current Vocational Education and Training plans disclosed shortcomings that are inherently built into the planning method itself, deficiencies include problems associate with centralization and objectifying of curriculum development and design, slowness in response to society needs and adaptation-oriented tendencies. It denies the opportunity of active participation for those directly concerned, i.e. in-company human resource planners and the young people themselves. If future can be foreseen and predicted more accurately, the more awareness of the possible shortcoming of the VET plans can be brought about and the better preparation and provisions can be made for these shortcomings.

Technical innovation of today and tomorrow creates a very complex world and to learn to cope with such complexity is now becoming overwhelming. One method to education and training of future vocational personnel may be **through innovative learning, by participation in the present and to anticipate of the future.**

To be more specific, one can argue that VTC objectives could include -

- The development of closer links between the operating units of the VTC and the local industrial and commercial enterprises,
- The development of core skills and/or key qualifications,
- Measures to ensure the parity of esteem of vocational education and
- Moves to promote continuous training and lifelong learning.

But we mustn't lose sight of the challenge we are facing with is that new forms of work organization and relevant human resources are required for the ever shortening product life cycle, new standards for quality assurance and an explosion in the implementation of new technologies. If the traditional forms of vocational education and training are not overhauled radically, both in concept and in its operating mode, one can doubt that whether it can achieve its objectives.

Comparison of the three basic methods of vocation education -

- Training on the job, trainees are assured of job and income security, but the program (e.g. apprenticeship) can be long and in a narrowly defined skill or trade. Ratio of trainee to training course is relatively small and cost can be relatively high.
- Training off the job in education establishments, has the advantages of accommodating a large number of students and offering a variety of courses, but require a minimum number of students and instructors for the course to be effectively and efficiently run. These programs tend to be inflexible and can involve expensive equipment. Also no guaranteed of employment after the course is completed.

- Combined type of Training on and off the job, co-operative work/study programs provide income and experience while allowing trainee to achieve an academic qualification, require close coordination of roles of employer and training institution.

For most developing countries, Vocational education (training off the job) is normally the favorite choice, since it has the least administrative and operational obstacles. For advanced industrial and commerce countries the combined type of training is normally the chosen form of Vocation education, e.g. Dual system in Germany and the Sandwich courses offered in UK and some European countries. In Hong Kong all three types of vocational education are practiced.

Efficiency and effectiveness of Vocation Education and Training, *how is it measured and monitored*?

- Most effective type of training. Measure benefits of a program derive from the quality of instruction or from the employment opportunities available.
- Cost efficient. Cost of a given training method is taken into account to measure against some form of economic and social returns of Vocation Education.

Review of Vocational Training Council Employment and Attrition statistics will soon identify some inadequacies of the current system. There are high drop out rate and low employment rate for Technical Institute students. The same statistics indicates that Technical College students did better but drop out rate still remains unsatisfactory. The main cause cited for the high drop out rate is that students lost interest in the courses they attended, very often in the first year of study.

The issue is not which method is more cost effective but rather under what circumstances one type should be chosen over another. **The solution must be reached by a systematic exploration of conditions.** Both economic and social factors will determine the choice. The decision to train workers on the job, off the job or with some combination of the two methods will therefore depend on the analysis of all these factors.

Economic factors - average cost per graduate, affected by the scale of operation, the optimum number of programs offered in the same institution, the nature of laboratories and workshops, the costs of teaching staff will be affected by its scarcity and quality.

The average cost of a program will depend not only on enrollment per program but also on the mix of programs offered by the institutions.

Social factors - characteristics of the labour market such as level of employment, level of wages and the entry requirement of jobs (some occupations have standard prerequisites for entry. Industry/commerce are bias against a certain type of education. The social image of a certain type of education (that is eventually determined by well-planned curriculum, competent administrators and teachers with both practical experience and pedagogical ability).

4. VOCATIONAL EDUCATION AND TRAINING OF THE 21ST CENTURY WORKER.

The traditional approach for vocational education and training is to provide skills and knowledge for the learner to adapt to current social and technological development. In other words, it always follows behind new technology and new economic development, learning to cope with what is new and what is needed. Very often students found that their knowledge gained in vocational training institutions are inappropriate, out of date and unsuitable for their needs. This is entirely inadequate for the new forms of work organization and relevant human resources, which is required for the provision of 21st century products and

services. Instead workers should be given the knowledge and skills to utilize available technologies, to control their work organization and to shape and design new methods / processes for new generation of products and services (F. Rauner, 1995).

Expertise cannot be developed through simple although extended information acquisitions, but only through continuous and subtle cognitive experiences related to putting knowledge into action, co-developing personal and professional knowledge into the larger dimensions of knowledge held by groups and whole organizations." (Attwell et al 1997).

The above statement on **work related knowledge** aptly describes the significance of types of skills and knowledge that Vocational Education and Training (VET) professionals have to recognize both as planners and as teachers. Further it might be useful to distinguish different types of knowledge. Lundvall and Johnson (1994) identify four different kinds of knowledge - know-what, know-why, know-how, and know-who.

- Know-what refers to knowledge about facts and information of the specific topic.
- Know-why refers to scientific knowledge, influencing technological development and the pace and characteristics of its applications in relevant industries. This is not dissimilar to production and reproduction processes in organized institutions, such as universities, scientific research organizations and technical colleges.
- Know-how refers to skills refers to skills and capabilities to do something ion different contexts, e.g. judging the market prospects for a new product, or operating a machine tool etc.
- Know-who refers to a mix of different kinds of skills, allowing the access and use of knowledge possessed by someone else.

Another important aspect concerning knowledge is that certain dimensions of knowledge cannot be taught or explained. "We can know more than we can tell" (Michael Polanyi 1962) explains that that there is a level of knowledge that cannot always be put into words or linearly explained. This level of knowledge can only be obtained by focusing on certain elements of the subject matter and by successive feedback of what was learned previously. To put it simply, by doing, practicing and learning from past experiences of successes and mistakes. This is very similar to the standard definition of skill - ability to do something well especially as a result of long practical experience and / or a particular technique.

The term **"work process knowledge"** (Attwell 1997) can be used to summarize the above statements of knowledge and skill - it can be regarded as knowledge encompassing the whole work process, often acquired through the experience of work, which is required for successful performance in the workplace. Thus work related knowledge and work process knowledge enables the workers and the workplace management to have clear focus on learning, knowledge acquisition and development.

However work experience or on the job learning alone does not lead to work process knowledge, it requires the guidance of teachers and trainers through a planned learning program. Without this structured program may lead to the learners' development of narrow mindedness and limited capability of reproducing what is observed. In the fore coming century, rapid changes in technology will continue, new forms of work organization will continue to develop and evolve. **Thus work process knowledge for the 21st century worker have to include not only a broader and deeper knowledge base, but also the capability of application and adaptation of these knowledge to cope with new situations and to meet future change.**

The implication of new form of work process knowledge will have profound effects on 21st century vocational education and training. Especially in Hong Kong, where economical, social and technological changes are influenced mainly and frequently by external factors. VET professionals will need to have a thorough understanding of their own subject based knowledge and competence to related occupational fields. They will need to have the ability to plan curricula and design learning programs to **incorporate**

knowledge of present and future context in which skills and competencies are to be applied Furthermore the concept of work process knowledge has to be linked to the idea of life long learning. Initial vocational education and training only forms the basis for the development of work process knowledge. It is this initial knowledge base that will help the new age workers to change and shape the 21st century work organization through the application of advance technology.

5. THE CONCEPT OF "SHAPING THE 21ST CENTURY WORKER" FOR THE HONG KONG MANUFACTURING AND SERVICE INDUSTRIES.

The philosophy of this concept is instead of people adapting to socio-economic and technological developments, they should be given the necessary competence to work self-reliantly and independently. They should be able to utilize creative and communication skills to shape work conditions, work organizations and work contents in order to create and facilitate innovations. This shaping concept can be achieved by imparting the relevant **work related knowledge** and **work process knowledge** to the intended individuals. But here lies the main problems of **what and how** to deliver this knowledge.

With technological advances, analytical and communication skills were required as well as more theoretical knowledge. In developed economies rapid technological change required workers with more flexibility and a deeper theoretical knowledge of their occupation. The abolition of some occupations and the creation of new employment opportunities necessitated training or retraining of workers. Industrial sector's growing demand of skilled workers, vocational education provides not only specific vocational training but also general education - reading, writing, mathematics and science. Thus the vocational education process is an integration of **all the transformational knowledge and methods ranging from identification of customers' need to fulfillment of customers' satisfaction,** both in terms of service and products.

The heart of the matter is **"What"** does industrial human resources need and "How" can these needs be satisfied? One method is that we can anticipate needs by referring to past historical statistics and to forecast future trends of requirement. Recent publication "Manufacturing 2000" by the Hong Kong Education and Manpower Planning Department will show that its validity and usefulness in forecasting the future is limited. Even the latest updated republication of this report fails to catch up with 1998/9 requirement, let alone year 2000 and beyond.

There are other innovative concepts, which are more futuristic oriented. The **Scenario method (G.Heidegger 1998)** suggests four scenarios of interconnected work, technology and education to describe possible situations of the future industrialized society. In order to plan more effectively for the provision of vocational education, systematic efforts has to be made and to take into account of prospects of future development of work and technology. If the future of work becomes visible, at least in the horizon, then it can become a decisive aspect in the anticipatory and shaping-oriented vocational education planning process. Briefly the four scenarios of future work can be summarized as follows -

1. Computer-aided Neo-Taylorism - work and technology become more prominent; work will be subdivided and automated increasingly. Human resources of two main types will be required - a. peripheral workforce with low qualifications and fluctuating composition to man the residual tasks (which can also be automated except that employment of labour is still more economical). b. Core staff of well qualified skilled workers for the complex design, development and production work.
2. Computer-aided Humane Rationalization - extensive and accelerated automation of all possible and suitable tasks, even if this increases economic costs, resulting radical reduction in working hours. The higher-level technical staff will carry out the work tasks in the professions that cannot be shortened as desired.

3. Dichotomized Re-professionalization - corresponds to present experience that is characterized by a relatively slow rate of development and introduction of technologies. The current industrial hierarchical structures will remain unchanged and that human intervention in production and administration will be significant. A new breed of semi academic skilled type of workers who can carry out a wide range of practice related and theory oriented type of work, adapting to technological, economical and political changes when it arises. The more capable elite of professional staff will still man the management tasks at a higher level.
4. Integrated vocational and general education - a non-futuristic technology scenario is assumed whereby simple peripheral jobs are retained. Various people acquire very different combinations of skills during their occupational life. Occupational work becomes more significant and that an integrated vocational and general education is required for the training of specified abilities.

Yet the economic, social and political structure and climate in Hong Kong is so complex and sensitive that any of the described scenarios or a combination of these scenarios can occurred, making the prediction of an overall picture almost an impossible task. However these scenarios can and will help if we try to segment the Hong Kong industries into different occupational profiles.

One can try to visualize that in Hong Kong, most business services e.g. banking, commerce, can be adapted to *Computer-aided Neo-Taylorism* scenario; information technology, telecommunication and the electronic manufacturing industry can be aligned to the *Computer-aided Humane Rationalization* scenario. While the majority of manufacturing activities in and surround Hong Kong can be classified as the *Dichotomized Re-professionalization* category and the more mundane and manual type of manufacturing operations which have been or being transferred and relocated to mainland China can be classified as the *Integrated vocational and general education* type.

But any visualization of these scenarios needs to be substantiated by factors, relevant trends and dimensions that can indicate its likely consequences. The Delphi method (Van Wieringen 1998) suggests structured consultation of experts by means of questionnaires and interviews might be required for the -

- Identification of patterns and trends in economic technological and industrial events.
- Classification of predetermined and uncertain variables and their order of importance and predictability.

This method might provide relevant information and data, yet it still does not produce clear-cut guidelines for the formulation of scenarios into different professional profiles. Recent study aimed at outlining future occupational profiles of teachers in primary education (Meelissen and Brandsma 1995) adopted the following approach. Two rounds of consultation in forms of questionnaire were conducted. During the first round, questions concerning factors, relevant trends and dimensions of related occupational profiles in general terms were surveyed. These questions are supplemented by subsequent discussions on the likely consequences and the probability of occurrences.

In the second round, respondents were asked to reconsider on those statements that bear low level of consensus.

Observing the pros and cons of the above approaches, the following methodology is suggested for the development of various scenarios, which in turns will provides detail information and guidelines for the formulation of related "**professional profiles**":

Phase 1 Investigation of local trends of industrial developments and future requirement human resource requirement by means of questionnaires and interviews of industrialists, technologists, educational professionals, economists and politicians.

Phase 2 Using data and information obtained from Phase 1 and applying "Shaping Methodology" to generate scenarios of possible future human resource requirement, survey of industrial organizations feedback according to these scenarios.

Phase 3 Summarize information to form basis for development of various professional profiles.

It is anticipated that the question of **"What does the Hong Kong industry need in human resources for the 21st century"** will be answered in the formulations of the **various professional profiles**.

The following are some of the suggested actions -

1. To conduct survey on past and present study and reports on the state of service and manufacturing industries of Hong Kong and China.
2. To conduct survey on past and present study and reports of technical education for manufacturing industries of Hong Kong and China.
3. To liaise with other leading vocational education institutions (e.g. Institute of Education and Technology, Bremen University, Germany) to gain experience and techniques on research methods, curriculum design and implementation of planned actions.
4. To visit manufacturing companies of various industries (e.g. plastics, metal working, electronics, light engineering, watch making, electrical equipment etc.) in Hong Kong and China, to conduct survey and research of their development plans for the next ten years, their investment plans, their requirement for technical support services.
5. To visit various companies of commercial and business service industries (e.g. banking, insurance, finance etc.)
6. To visit various technical education institutes in Hong Kong and China, to conduct survey and research into their existing and future plans of provision of technical education for the manufacturing industries.
7. To review surveys conducted by various government agencies on economic, political and social environment that will affect the development of the manufacturing industries.
8. To review surveys on trends of student preference of study, their ability of learning of technical subjects, their future outlook on their employment and the supports given by various government and private institutions on technical education.
9. Collate and summarize gathered information and data, utilizing a special designed computerized simulation model to analyze these data and information to generate summarization of individual scenarios for the provision of technical education in Hong Kong and Southern China.

6. THE PROVISION OF WORK RELATED KNOWLEDGE AND WORK PROCESS KNOWLEDGE FOR THE VARIOUS PROFESSIONAL PROFILES.

Here lies the main problem of how and in what form. If the goal of vocational education and training is to provide individuals with competence

- To work self-reliantly and independently,
- To utilize creative and communication skills to shape work conditions, work organizations and work contents,
- To create and facilitate innovations,

Then one must examine the effectiveness and efficiency of existing traditional form of vocational education and training. Review of current vocational education and training system shows it often lacks objectivity and the approach is bottom to top. That is -

- Too much method oriented in the curriculum and requires too much learning.
- In most areas, students lack motivation, case experience and confidence.

- They cannot be ready to deal with open-ended practical problems.

In observing the highly developed industrial countries, their established vocational training systems were largely established base on the following criteria:

- Consider how to meet social needs.
- The world is much more technologically and economically competitive.
- Demand on quality and capability of graduating students is high and diversified.

Acquiring ability to co-shape work and technology has become a guiding principle for vocational education and training (F.Rauner 1995). The overall objective is to provide the trainees with work process related abilities and their ability in continuous acquisition of updated work process and related knowledge. It was suggested that work process knowledge should be provided in the form of key qualifications, encompassing work and technology at all relevant levels. Thus VET not only prepares one for occupational work, but also develops one's formal abilities to co-shape work and technology by a design of interchangeability of curricula, through the guises of key qualifications.

This concept was further explored and applied extensively in the "Car Mechatronic Concept" project (F.Rauner, G. Spottl, 1995), a European occupational profile for the initial training of a Car Mechatronic. Subsequently a curricula framework was developed, providing vocational education and training in response to the structural changes in the car service sector from traditional garages to modern services businesses, featuring customer oriented quality work. The car mechatronic is able to deal with all aspects of modern high-tech cars and service demands of customers. The Car Mechatronic is also provided with the ability to participate in shaping work and technology.

The initial training of Car Mechatronic oriented towards work process knowledge, especially prone to workplace based. Deeper, specialized knowledge will be provided through further systematic training. Thus the curriculum for a Car Mechatronic aims at a practice-oriented vocational training, facilitate by specialized training programs through training institutions and participating companies.

This concept also promotes innovation in work organization of the workshops, introduction of team concepts, increase flexibility of the employees and improvement of co-operation with car manufacturers.

On close examination the curricula structure of the Car Mechatronic concept is neither based on traditional school based vocational education where all relevant available technical information are taught, nor it is based on company based vocational training where it is normally structured around fragmented tasks to provide restricted area of objectively measured skills. Rather it is developed along a content driven and work process approach. In other words the contents of the curriculum are gained through work processes but not technology.

If the aim is to cover the knowledge and skill required by a competent worker for the required work tasks, then work itself has to be treated as an entity, the related work tasks in the workplace can then be listed and structured into learning fields and classified into levels.

The learning areas covers:

1. Objects of skilled work - functional work related knowledge.
2. Tools, methods and organization of skilled work - functional work process knowledge.
3. Requirements for skilled work and technology - integration of functional work related and work process knowledge.
4. Training objectives - application of skills and knowledge, enhanced with social and communication skills to achieve the objectives of work.

According to degrees of complexity and difficulty, the skills and knowledge provided to the prospective trainees can be classified into three or four levels, ranging from basic to specialized training.

A work process oriented curricula can be designed, consists of two inter-related structural areas, the learning contents and knowledge of work process. According to the proximity of relevant validity, the curricula can be delivered in either the VET institutions or the workplace itself. Close collaboration between VET professionals and workplace supervisors/management will form the backbone of the teaching/supervision function, with special emphasis place on continuous feedback, improvement and development of work related and work process knowledge.

Thus VET professionals of the new age not only have to be conversant with their own subject areas, but have to continuously updated themselves in the relevant field of work and to possess the capability of designing, developing and delivery of the new form of vocational education and training.

7. HOW TO DELIVER THE NEW FORM OF VET?

The above describes briefly the macro structure of new form of VET; but question of "how" in terms of micro details have yet to be answered. If one looks at training and education, the term "Course" inadvertently appears. Generally speaking course can be described as a sequence of structured learning with a time interval between each session and the next. The course may stands on its own or it may be part of a program of studies aiming towards a formal qualification. But what types of courses are appropriate for the new form of VET? Could it be the combination **of "knowledge-oriented courses ", "Methodological courses" and "Issue-based courses"** (D. Rowntree 1981)? The question remains at how do we combine subject matter knowledge and the methodology of various academic discipline to prepare the student for the work tasks intended.

Knowledge-oriented course aims to get the student to learn and apply the subject matter for its own sake, but not as a vehicle for learning something else. Most pure science courses come into this category, e.g. physics, engineering sciences, biology, chemistry, etc.. Abundant subject matter has to be learnt by the student. Often, memorizing data and facts becomes more important for the student, that is if they want to pass the examination and gain the qualification intended. This leaves little time for them to think about it and to apply it to real life situations.

Methodological courses aims to provide intellectual, physical or social procedures or skills so that students can be a performer in the subject, rather than a spectator or a commentator on the knowledge achieved by others. Methodological courses can be of two types: Task-oriented and Discipline oriented.

Task oriented courses train the student to carry out some clearly defined activity, normally at technician level. Series of specific tasks and procedures are designed to train the students to deal with predictable work situations. Here only "how to do it" knowledge is transmitted.

Discipline oriented courses provides the opportunities for the students in learning a methodology that can be adaptable to a wide variety of circumstances. This methodology encroaches skills and knowledge that will enable the students to apply what they know, to acquire what they don't know, to think and deploy new and improved ways to tackle the work tasks at hand and within their subject area.

Issue-based courses centers on some issue or problem, which are seen to be relevant and significant to the student. The teaching will provide the students with conceptual tools and methodological tools for resolving the issue or arriving at a reasonable solution of the problem. These courses can often be multi-disciplinary whereby the contributing disciplines are introduced separately and attempt to inter-relate them towards the problem solution.

Before we can further our investigation into what courses and curriculum for VET, we must also include the students' needs into our considerations. It is crucial that if we were to motivate students we must identify and fulfill their needs. Their ability and capability to be educated and trained has to be taken into account as well.

If we can identify that the students needs hierarchically, it is argued that they will need to

- Get a job to provide for their physiological needs,
- Get a secured job so that they can feel safe,
- Get a responsible job so that they can be of social significance,
- Get a job with good promotional prospects to extend and to actualize their intelligence capacity and capability.

Thus if any VET program is to be effective, it must also caters for the students' ability, capability and needs.

Project based learning (J. Henry, 1994) represents a different approach form traditional schooling. Instead of the teacher deciding what topics and materials are relevant to the student. By definition, project is a set task given to students, to be completed at a given period of time, subjects are taught with some reference to some chosen topic, and students are encouraged to make independent enquiries to supplement formal teaching. In Project based learning, the students are allowed more control of the topic, seeking and equipping themselves with knowledge and skills that contributes to the solution of the task/problem at hand. The teacher takes on a different role, becoming more of a facilitator and adviser than pedagogue and expert.

If the overall objective of VET programs are to provide the trainees with work process related abilities and their ability in continuous acquisition of updated work process and related knowledge, then a **combined approach is suggested. Project based learning, incorporating various learning areas, structured in relevant levels, where work related and work process knowledge is transmitted and practiced through a combination of methodological and issue based courses, in VET institutions or in workplace where appropriate.**

Thus tasks in the workplace can be grouped and classified into projects of different levels.

Learning contents of projects can be provided in learning institutes, in the form of methodological and issue based courses. This will enable work related knowledge to be gained by the students.

Thereafter work related knowledge is used for practice in simulated situations, preferable in the VET institutions, allowing the students to gain some insight into the work process knowledge that lies ahead in the workplace.

The students will practice work related knowledge in assigned workplace to gain skill and work process knowledge in project form, gradually working their way up through different levels, gaining the competency, skills and knowledge intended for their field of work.

Under the tutorship of experienced supervisors and VET professionals, social and communication skills are obtained and utilized by the students, enabling continuous feed back and to seek further improvements.

After the completion of groups of projects in designated areas and progressively at different levels, the students will then be able to handle work independently, coping with unforeseen problems and to continuously update and improve themselves.

8. TRAIN THE TRAINERS.

If teachers and trainers are to utilize the workplace as the basis for lifelong learning, then they, themselves will need a thorough grounding in occupational/technical skills and work process knowledge. So far the focus was on the design of workplace as a medium and opportunity of acquiring work process knowledge, attention has to be paid to the role of teacher and trainer in mediating and facilitating this process. VET professionals should have an understanding of the theories of learning and be able to design learning situations based on the needs of the trainees, as well as the possession of skills and knowledge that will allow them to move from different contexts for learning.

Most Hong Kong VET professionals are predominantly professional teachers or practicing professionals. Very few have undergone specialist VET education as such. On close examination, VET professionals should possess both technical and pedagogical skill, especially if the suggested "Shaping" concepts of various professional profiles are to be practiced. In Europe, similar problems are encountered.

The report on new curriculum profile for the education of VET professionals"(G. Attwell, 1997) highlights the shortcomings of university programs in Europe, that it is normally based on academic areas and usually short and low level training courses. Most of these courses are for the development of training and competencies for skilled workers. The report carries on to point out that a strategic approach is required for the education of VET professionals. This analysis has led the European Commission to initiate a project new Forms of Education of Professionals for Vocational Education and Training"(EUROPROF). Subsequently a curriculum framework outlining the structure and content of a new Masters (MA) Degree qualification is produced. The program consists of four sections:

1. General background for vocational education and training including the history, structures and systems of VET and the economy and the labour market.
2. Vocational pedagogic covering the theory, practice and research in VET, methods and tools of research in social sciences, VET didatical theories, methods and approaches.
3. Examination of the development of occupations and occupational fields; the development of curricula and its related teaching and learning processes; opportunities for the development of learning situations for the analysis, shaping and evaluation of occupational work; development of life long learning and professional expertise through participation in the shaping of work.
4. Specialized area underpinning occupational profiles and skilled work in related area includes both theory and practice in the general subject and specialized areas within that subject.

There is little doubt that VET will be critical for the economic and social development in Hong Kong, especially into the 21st century. Future economic and employment development does rely heavily on the skills and knowledge of its workforce. There is urgent necessity for Hong Kong VET professionals as an entity to review their capabilities in meeting the future VET needs, to update and educate themselves, to help to shape the new VET principles that is in much need for the implementation of the new form of VET.

9. CONCLUSION.

The customary processes of initial and continuing vocational education and training do not prepare and equipped workers with ability and capability for the work activities of the 21st century. New concepts of occupational-related didatics, with their methodological implications, along with emphasis on life long learning will need to be developed. Attention of VET has to focus upon the provision of multi-skilling, flexibility and adaptability, ability to shape the design and organization of work for the 21st century worker.

VET professionals serve key functions in initiating and implementing a (initial and continuous) shaping oriented vocational education and training. In order to qualify and equip VET professionals in these capacities, the form and quality of their own initial and continuing education is of decisive importance.

The way ahead.

If the overall objective of VET is to equip Hong Kong with a well trained workforce to meet the demands of a dynamic economy and to contribute to the overall economic competitiveness (Education and Manpower Bureau, 1997), then a proactive rather than a reactive approach has to be adopted. One of the current Vocational Training Council commitments is to identify a new methodology so that improved labour market analysis can be carried out.

If this methodology is to be proactive, a more pragmatic rather than hypothetical approach has to be adopted. Industries has to be consulted and surveyed to form possible **scenarios** of what human resources might be required for the future. It is proposed that VET professionals will then apply the "**Shaping**" concept, enhancing these initial findings, according to various occupational requirement, forming "**professional profiles**" to suit relevant industrial needs. To ensure the validity of these so call "professional profiles", it is suggested that both industries and prospective students are to be briefed and consulted, inviting feedback for further updating and improvement of these "professional profiles".

A pilot scheme can be conducted into one or two of the main industries, e.g. manufacturing industries, banking service industries. The outcome can be used for development of an overall labour market analysis methodology. Further these outcome could be used as basis for development of "Shaping" concept of VET - that is, an integrated package with different levels of project based tasks groups through the provision of necessary work related and work process knowledge in relevant Professional profiles, jointly administered and delivered by VET professionals and workplace management. Similar schemes can be developed, taking into account of experiences and further improvement, for other industries.

Such pilot scheme can be planned, potential support can be sought from:

- Hong Kong Vocational Training Council, in the form of human, financial and facility resources, and in providing the background surroundings for conducting such research.
- Institute of Technology and Education, Bremen University of Germany (a world leading institution in vocational education) where experts' research experiences and facilities in related fields can provide guidance in planning, research and implementation of the pilot schemes.
- Education Development Unit, Hong Kong Polytechnic University, where pedagogical and didatical experiences and knowledge for local environment can be provided in forms of short courses and mini research projects.
- Institute of Vocational Education, Shanghai Tongji University PRC, where vocational education and training experience and research data can be shared through collaboration projects.

Equally important and urgently needed is that VET professionals have to be re-equipped with skills and knowledge to design, develop and deliver the new form of VET for the 21st century worker, base on the "Shaping" concept. To this end help has to be seek from other institutions that has prior experience in relative field.

In summary, development of "Professional Profiles" and VET professionals, in my view are two of the most important aspects that are in need of urgent attention. It is hoped that my limited contribution in the form of this report can provide some stimulus and impetus to the acceleration of provision of Vocational Education and Training for the Hong Kong 21st century worker.

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BIOGRAPHY

Mr. Manwey Leung is a Senior Lecturer of the Manufacturing Engineering Department in the Institute of Vocational Education (Chaiwan campus). He is a Chartered Engineer and a Senior Member of the Chinese Mechanical Engineer Society. He has worked in manufacturing industries covering various European countries for over twenty-five years, ranging from production engineering, to product development and to project management. His previous employers include Black and Decker PLC and Lucas Industries. In 1995 Mr. Leung was nominated by the Osaka Business Council to participate in the Factory Improvement Program in Osaka, organized by the Association for Overseas Technical Scholarship (Japan). A strong advocate of the 5S discipline in manufacturing, Mr. Leung believes that the human centered approach supported by appropriate discipline is a vital ingredient for success in manufacturing industries. The phrase CANDO (cleanliness, arrangement, neatness, discipline, organization) coined by Mr. Leung is widely used in Japan and United Kingdom, in conjunction with the 5S activities. Currently Mr. Leung is teaching manufacturing engineering subjects and conducts research into Knowledge-based teaching / learning methodology for vocational education and training.

QUALITATIVE MEASURES OF THE RESPONSIVENESS OF POSTSECONDARY TECHNICAL PROGRAMS TO THE NEEDS OF INDUSTRY

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Index: Community Colleges; Institutional Responsiveness; Postsecondary Technical Education

Abstract: Institutional responsiveness is a measure of how responsive an institution is to its market. The market includes all stakeholders (students, businesses, and the community). Several major issues were examined in this study, including responsiveness to the labor market, job placement, graduation rate, and quality of program. Implications from this study should be quite useful to IVETA and members of our global community. The study was funded by a grant from the Pennsylvania Bureau of Vocational Technical Education under the auspices of the Carl D. Perkins Vocational Education Act (Public Law 105-332-Oct. 31, 1998).

INTRODUCTION

A fundamental question that continues to be a major issue in the delivery of postsecondary technical and occupational education programs is: how responsive are community colleges and two-year proprietary institutions to the labor market in establishing appropriate programs? We are aware that American business and industry need a highly skilled workforce in order to compete in a global economy, community colleges and other two-year post-secondary institutions are in the best position to fulfill that need (Grubb, 1996; Farmer & Key, 1997; McCabe, 1997; and Bragg, 1998). We also are aware that 65% of jobs in the new millennium will require more than a high school education but less than a 4-year college degree (Gray & Herr, 1995). Nevertheless, the question concerning institutional responsiveness to the labor market continues to be debatable among stakeholders.

In the state of Pennsylvania there is a critical need for postsecondary technical education data in areas such as program outcome and follow-up measures to include employment trends and types of training provided to graduates of two-year institutions, both public and private. In the Commonwealth, there is also a need to provide legislators and educational leaders with appropriate information to make appropriate decisions on the management of post-secondary technical education. Therefore, the purpose of this study was to conduct a series of case studies in order to provide an in-depth understanding of postsecondary technical and occupational education programs in community colleges and two-year proprietary institutions in Pennsylvania. The study was divided into three phases: Planning and Organization, Implementation, and Follow-up. This paper describes the results of the third phase that involved follow-up measures of postsecondary technical and occupational education programs in Pennsylvania.

CONCEPTUAL FRAMEWORK

The design of all research requires conceptual organization, ideas to express needed understanding, conceptual bridges from what is already known, cognitive structures to guide data gathering, and outlines for presenting interpretations to others (Stake, 1995). The framework for this study is based on the state of-the-art principles in Stake's work, *The Art of Case Study Research*. Actually, the case study is a compromise between Ethnography and Grounded Theory; both are qualitative methods that are suited for different purposes. Ethnography gives us the richest understanding of the culture and ethos of a particular program, event, etc., but it is very time consuming and has very limited generalizability. On the other hand, Grounded Theory promises greatest generalizability among qualitative research methods but is often quite costly and time consuming. The case study does not give as rich an understanding as Ethnography, and it is less costly and time consuming than Grounded Theory.

METHODOLOGY

A qualitative research perspective was employed using the case study approach. This approach was considered the best methodology for addressing the magnitude of issues that exist in Pennsylvania's two-year postsecondary institutions that offer technical and occupational education programs. Moreover, the case study approach was selected because this study focused more on insight, discovery, and interpretation rather than hypothesis testing. Other researchers concur with the author in using this approach. For example, Grotelueschen (1980) offers an essential reason for choosing a case study design when doing evaluation or follow-up measures: "case study is appropriate when the objective of an evaluation is to develop a better understanding of the dynamics of a program. When it is important to be responsive, to convey a holistic and dynamically rich account of an education program, case study is a tailor made approach." Gall, Borg, and Gall (1996) stated that a case study is done to shed light on a phenomenon, which is the processes, events, persons, or things of interest to the researcher. Some examples of phenomena are programs, curricula, roles, and events. Once the phenomenon of interest is clarified, the researcher can select a case for intensive study (Gall, Borg, and Gall, 1996). However, a case is a particular instance of the phenomenon. Finally, Merriam (1988) reinforced the assertion that the case study is particularly suitable for dealing with critical issues of practice and extending the knowledge base of various aspects of education.

DATA SOURCES

A project research team was organized to conduct five case studies of selected urban and rural community colleges and two-year proprietary institutions in Pennsylvania. The project research team consisted of a project director, qualitative researcher/consultant, and three graduate research assistants. Using the following procedure, the project research team: (a) received formal instruction on case study research from the qualitative researcher, (b) selected appropriate case study locations, (c) conducted on-site observations, (d) debriefed with the qualitative researcher, (e) refined field notes, (f) transcribed tape recordings of interviews, and (g) analyzed data using triangulation and Atlas software. The selection of the institutions was based on four essential characteristics: location, financial aid available, academic reputation/quality, and support services available. The five case studies were designed to investigate two qualitative research questions: (a) how responsive is the institution in establishing appropriate technical and occupational education programs, based on the needs of the labor market? and (b) how responsive is the institution in providing effective instruction?

In reference to site and sample selection, five institutions were chosen for their unique qualities. The specific qualities of each institution are described as follow: (a) Northampton Community College is located in a rural area and it is a residence campus; (b) Delaware Community College is also located near the suburban area of Philadelphia and is unique because of its exceptional facilities for individuals with disabilities; (c) Bradley Academy for the Visual Arts was chosen because it is a proprietary institution with a distinguished reputation in visual arts; (d) Pittsburgh School of Aeronautics was chosen because it was also a well known proprietary institution in another geographical location; and (e) Community College of Allegheny County was chosen because it is the largest and most influential among the community colleges in Pennsylvania.

TRIANGULATION OF DATA

A major strength of case study data collection is the opportunity to use many different sources of evidence (Yin, 1994). The triangulation data collection procedure was used to review, analyze, and verify the institutions ability to be responsive to their labor market. According to Yin (1994), triangulation is a strategy that allows different qualitative research methods to be combined. Moreover, Miles and Huberman (1994) suggested that by looking at a range of similar and contrasting cases, a single-case finding could be understood. Other researchers have also concurred that the combination of three or more research methods through triangulation provides a greater assurance of validity within a study (Bogdan & Bilken, 1992; Maxwell, 1992; Yin, 1994).

FINDINGS

The results of the case studies revealed many useful findings regarding the responsiveness of community colleges and two-year proprietary institutions to the needs of the labor market, graduation rate, job placement, and quality of programs. Lauch Faircloth's, United States Senator (Republican-North Carolina), public statement expressed the essence of the findings. He stated, "community colleges are the only job training program I have ever seen the federal government put its money into that works." Moreover, President Bill Clinton articulated the importance of community colleges for all Americans in his speech at Gulf Coast Community College in Panama City, Florida. The President stated: "I believe America ought to work the way the community colleges in America work. I believe they are the ultimate democratic institution, small "d"; open to everybody, where everybody has a chance; results-oriented; flexible, not bureaucratic; and working in partnership with the private sector; and guaranteeing opportunity for everybody who is responsible enough to seek it" (Clinton, 1996).

The findings from the five studies revealed four major themes: policy issues, student profiles, labor market issues, and curriculum content. In the area of policy issues, it was revealed that Pennsylvania experienced a brain drain, the migration of 13,500 labor force age adults (20 to 29 age group), between 1995 and 1997. Policy is needed to provide incentives to prevent this migration of human capital. Student profile data showed that male students outnumbered female students in postsecondary technical programs. This particular finding is inconsistent with national data that shows there are more female students (52%) than male students (48%) in community colleges. Public opinion supports the belief that students attending community colleges do so with the intention of transferring to a four-year institution. However, the findings revealed a different picture; most of the postsecondary technical students indicated that their career goal was to enter the labor force upon graduating from their respective programs. In the area of labor market issues, most of the students were interested in completing some of the "hot" technical programs, i.e., computer-related technologies. The "hot" programs represent the technical skill areas that are critical for high

technology and nationally competitive industry and businesses. The final theme related to curriculum content, most of the postsecondary institutions had begun incorporating tech prep and school-to-work initiatives to improve their curriculum. The results of the curriculum inclusion have been positive because community colleges are starting to receive recognition for their product—the student. The graduates of community colleges are making a favorable impact in the workplace, as indicated by noteworthy business leaders.

One of the most successful business leaders in America, Bill Gates, CEO of Microsoft, recently expressed his approval of community colleges in preparing persons for the workforce. Gates stated that "America is leading the way in high technology and in the next seven years it's estimated that 80 percent of new jobs in this country will be in high tech. Community colleges have an important role to play in making certain we have skilled workers ready to help businesses take advantage of all the opportunities in the Digital Age." Jim Adams, chairman of Texas Instruments, indicated "the community college system is an absolutely imperative part of the fabric of education in this country. It's the thing that will help us be competitive leaders in the world, and corporations like mine have to retain a competitive leadership throughout the United States and throughout the world." The job placement rate in community colleges is very impressive; community college leaders indicated that the vast majority of the graduates obtain employment.

On the other hand, however, the graduation rate is not impressive. In actuality, the graduation rate for community college students in postsecondary technical degree programs is less than 40 %. The low percentage may be attributed to: (a) part-time enrollment of non-traditional students, (b) students transferring after one year to a four-year college or university, and (c) students being employed in their career area before graduation and deciding not to complete the degree requirements

The question surrounding institutional responsiveness, concerning the quality of programs in community colleges, may be best expressed by two of their famous graduates, Kweisi Mfume, President of the National Association for the Advancement of Colored People (NAACP) and Norman Rice, former mayor of Seattle. Mr. Mfume stated "my tenure at CCB (Community College of Baltimore) was undoubtedly one of the most memorable times of my life. It was there that I began to stop dreaming about the goals I would achieve and instead set forth a plan to make them happen." Another famous graduate, Norman Rice, former Mayor of Seattle, stated "community college prepared me and gave me the confidence I needed…community colleges are a great bridge, a bridge from high school to college, from welfare to work…"

IMPLICATIONS

Although the case studies were oriented entirely to the needs and idiosyncrasies of the Commonwealth of Pennsylvania, they have international implications for the ways in which postsecondary technical education programs in community colleges and two-year proprietary institutions are managed and delivered. As leaders in IVETA, we know that a well-educated and technically trained workforce is essential to the growth and development of a nation. Moreover, global competition in the marketplace will intensify the demand for all nations to possess an increasingly competitive workforce. The high performance demands of the new millennium and the rapid technological changes in the workplace dictate a need for technically skilled workers with high-tech employability skills.

The results from this study may help educational leaders and policymakers who frequently make more informed decisions regarding the future of educational programs based. For example reliable data regarding graduates and their job placement and rate, graduation rate, and the overall quality of their respective programs would be useful data for educational leaders in the global marketplace. Moreover, the results from this study may stimulate the thinking of business and educational leaders

in the global marketplace with policy ideas to develop a management information system to assist employers with personnel management decisions regarding recent graduates of postsecondary technical programs.

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Acknowledgements – This research was based on a funded project by the Pennsylvania Department of Education, Bureau of Vocational Technical Education. A Special thanks is extended to Henry O'Lawrence, Kisha Cunningham, and Jack Lee, Penn State University, for serving as research assistants to the original project and helpful comments in developing this paper.

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GLOBAL E-LEARNING
TENDENCIES AND POSSIBILITIES OF USING THE INTERNET FOR VOCATIONAL AND EDUCATIONAL TRAINING

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Index: Distance learning, Web based training, Learning platforms

Abstract: The Virtual Training Center (VTC) integrates the ideas of media-based learning environments into the idea of the learning platform which has increasingly influenced theoretical discussions at international congresses (e.g. Learntec 2000, Karlsruhe, see www.learntec.de).

The VTC simulates a training center in the web and serves as a platform of internet or intranet based courses and self-learning media. Seminars and workshops can be held, media and documents can be worked on and administered and know-how can be exchanged.

The basic idea of the VTC is to create a web-based infrastructure which shelters all possibilities of web-based teaching, learning and training.

INTRODUCTION

In the age of the internet, the term "learning environment" embraces a new dimension.

The system presented in the following tries to meet the conditions made on an internet-based teaching, learning and induction system.

According to Peter Strittmatter/Helmut Niegemann („Lehren und Lernen mit Medien", page 7 ff, page 138) a system must have the following functionalities:

1. Teaching function
2. Interactivity
3. Adaptivity
4. Self-control
5. Modalities

1. BASIC MODULES

1.2 The Entrance

After the learner has logged in, the entrance of the VTC appears.

The individual rooms can be entered with a mouse click.

An information board shows the current seminars and workshops. The individual courses can be selected from here. With a mouse click the Participant jumps directly into the auditorium.

1.3 The Assessment Center (AC)

With the help of the Assessment Center the demand for training and further education of individual employees, work groups or entire organizations can be assessed. Here, tests can be implemented which can be evaluated and analyzed by the system.

Furthermore, there is the possibility of recommending to individual employees or groups the participation at seminars or the use of teach-yourself media within the VTC. The contents of the Assessment Center are to be developed and implemented with regard to the specific demand, they are not included in the Basic Module.

1.4 The Auditorium

In the Auditorium the speeches and presentations are given.

On the screen a Video Window, a Media and Document Window and a Discussion Window appear which fulfill the following functions:

- **Video Window**

  Here the trainer or presenter giving his speech is shown by video.

  Below the Video Window there is the control bar which enables the functions „start", „stop", „forward" and „back". After the presentation the video is transferred into the Folder of the learner (see 3.1 for function of the Folder).

- **Media and Document Window**

  At the right side of the Video Window there is the Media and Document Window.

  Here the text and graphic documents revised by the presenter are shown; they can be transferred to the Folder as well.

- **Discussion Window**

  The Discussion Window is placed below the Video Window and the Media and Document Window. In the Discussion Window, the course of the presentation is documented in form of brief notes; also documented are the discussion contributions (Q&A's from the presenter as well as the learner).

The speech can be summarized by the Trainer and be shown in the Discussion Window with the accompanying documents. These will be seen as icons. The Participant can choose to view the documents or to transfer them to his Folder (see 3.1). The documents can be processed further with the Office applications.

Furthermore, there is the possibility of putting individual hyper links into the key words of the notes, which connect to stored documents, explanations or contacts as well as further web sites in the library. Questions and comments of the participants are represented here as well.

The Discussion Window also shows the state of the Trainer and Participant. The following is stated:

The Trainer's and the other Participants'

- presence
- absence
- activities (e.g. would like to ask a question or is sending a document).

1.5 Self-learning Center (WBT)

In the Teach-yourself Center, the learner can work with media like Computer Based Training (CBT) or Web Based Training (WBT). The use of the media can be on line in the web or off line with a download. The media are administered in the WBT. The Administrator, Trainer and Participant have numerous evaluation possibilities such as access, duration of use, results of study or state of study.

The media are to be developed according to specific demand and are not included in the Basic Module.

1.6 The Evaluation Center (EC)

The Evaluation Center enables the learner to check his knowledge. Tests and exercises which are evaluated by the system provide information about the learning success and knowledge deficits.

The individual tests and exercises are to be developed in regard to the specific demand and are not included in the Basic Module.

2. ADDITIONAL MODULES

2.1 The Team Center (TC)

The Team Center is meant for group work in the VTC. The TC is divided into sections in which individuals or groups can work on their tasks.

In the left window the members of one's own group and the other groups are represented as „placeholders", i.e. the presence of the group members are presented graphically (symbol, photo or picture of the member). On clicking on a placeholder a window opens in which the team member is presented briefly (e.g. name, telephone number, division, place, function, address, photo). Apart from the team members, the Trainer can also enter the Team Center. It is possible for him to follow the discussions and tasks and to intervene in individual processes if necessary.

2.2 The Simulation Center (SC)

The Simulation Center enables and supports the work with virtual and/or real instruments or equipment. One can use in practice what one has just learned.

The contents and the virtual instruments or equipment are to be developed with regard to specific demand and are not included in the Additional Module.

2.3 The Coaching Center (CC)

In the Coaching Center, the learning and transfer processes are accompanied by e.g. curricula or task lists developed separately or by best-practice-solutions stored in the data base.

3. PERMANENT FUNCTIONS

3.1 Basic Functions

3.1.1 Folder

All the Trainer's and learner's documents sent and selected are transferred into the Folder.

When a document is sent, the addressee receives a message (e.g.: You've received a message or a document.).

Apart from information and documents, also tasks and notes as well as electronic documents can be transferred into the Folder by the Trainer or another learner.

3.1.2 Information Board

The Information Board presents all seminars, workshops and documents available in the Virtual Training Center.

They can be selected directly from the Information Board.

The information can concern past courses or be an announcement of future courses. At the same time, information is shown such as names of contacts or-documents available for the course. It is also possible to electronically enroll for individual courses from the Information Board.

3.1.3 Information Manager

The Information Manager puts all relevant information at the Trainer's and the Participant's disposal.

Search Functions

- Topic

  e.g. staff, marketing, strategy
- Period of time

  The search can be limited to certain years/months etc.
- Piece of information

  e.g. document, medium, web sites, seminar

A combined search is also possible (e.g. all regulations for bookkeeping in the period of 1997-1998).

Right of access

Trainer and Participant can have different rights of access within the VTC (e.g. participating at a certain course and access to all information in the library). The rights are shown to him via the function „right of access".

News

News on the Training Center can be viewed here.

Schedule

The Schedule presents the individual dates concerning the courses (e.g. day of presentation, submission of interim results).

3.2 Additional Functions

3.2.1 E-Communication Functions

The learner and the Trainer have the following electronic communication functions at their disposal permanently:

- **e-mail**
  for transferring texts and documents

- **e-audio**
  for transferring acoustic information (e.g. as an audio conference)

- **e-video**
  for transferring videos

- **e-document**
  for transferring and jointly working on documents (document sharing)

When a function is selected, a window opens with the relevant application.

The implementation of the individual systems (e.g. video and/or audio conference system) is prerequisite for the E-Communication Functions.

3.2.2 E-Office Functions

The Microsoft Office applications (e.g. Word, Excel, PowerPoint, Access and Project Manager) can be opened via mouse click at any time in order to work on documents.

Prerequisite for the E-Office Functions is the previous installation of the applications on the computers in use.

3.2.3 Presentation Manager

The Presentation Manager is a function for the preparation of the courses and the presentation of results. When the Presentation Manager is selected, a window opens in which the course of the presentation is shown.

Via drag and drop the presenter (Trainer or Participant) can arrange chronologically the documents and media which he e.g. transferred into the Folder.

When presenting, these can now be selected and will then appear in the Media and Document Window of the Auditorium.

At the same time the presenter can enter the notes of his speech, e.g. in form of a structure, and attach the individual documents to the individual notes.

3.2.4 Editing Manager

The Editing Manager enables the Trainer to create contents and exercises in the modules of the VTC. With the Editing Manager exercises can be created in the Evaluation Center which are put at the learner's disposal randomly and evaluated afterwards.

4. ADMINISTRATION OF THE VTC

4.1 Administrator

The Administrator (Supervisor) is responsible for the entire administration of the VTC. His tasks are mainly to administer the data base and supervise the users, as well as supervising the rights of access and servicing the system.

Administering the data base includes the registration and changing of data regarding the participants and trainers, data such as name, user name, password, e-mail address, company, place, function or photo as well as right of access. Moreover, the Administrator supervises the so-called active data, i.e. the data variable over a period of time, e.g. the documents or media for a course or the results as well as the rights of access.

The supervision of the users includes the functional part of the system. Users having problems with accessing the system or the electronic communication have to receive competent help.

Servicing the system includes installing updates and regularly checking all functions so that a flawless use of the entire VTC can be guaranteed.

4.2 Trainer

The Trainer is responsible for the technical contents of the courses and the educational supervision of the learners.

The Trainer logs in to the system with his user name and personal password. According to his current rights of access, he receives certain rights such as access only to his own course and relevant information in the library.

He can store, call up and work on his media and documents in the library. The information is stored via the Central Web Based Data Base in from of a graphic interface. The Trainer can select the media and documents and decide where in the library they are stored.

Via the Trainer's rights of access it is guaranteed that he can only change or complete data in regard to the course within in the library.

4.3 Participants

Just like the Trainer, the Participant also logs in to the system with his user name and personal password. He, too, receives the current rights of access from the Administrator; e.g. he only receives access to a course if he has paid it in advance.

4.4 Automated Processes

Automated Processes are based on rules which reduce the administration. If, for example, the Trainer invites the Participants to an auditorium meeting, e-mails are sent automatically to the participants and their rights of access are changed in such a way that they will have access to the data and to the planned meeting at the stipulated time.

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A COMPARATIVE STUDY ON THE STRENGTHS AND WEAKNESSES OF THE STUDENTS BETWEEN CHINA AND HONG KONG

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Abstract In August 1999, three lecturers and fourteen students of Zhejiang University of Technology (ZUT) and Hangzhou Institute Applied Engineering (HIAE) were invited by the Department of Electrical & Communications Engineering (EE) of Institute of Vocational & Education Tsing Yi (IVE/TY) coming to Hong Kong for a Student Exchange Summer Camp. Joining the camp were seven year 1 Higher Diploma students from the EE department. The objectives of the camp were three folds: (a) to find out any difference in the command of English for the post secondary school students from China and Hong Kong; (b) to substantiate an effective means for the learning of Putonghu ; and (c) to investigate the practical skills and mentality of these students. A series of activities were organized for the students and their performances in all activities were analyzed to achieve the objectives of the comparative study for these two groups of students.

INTRODUCTION

The fourteen students from the two institutes in Zhejiang province were mainly year 2 students in their respective courses, which was equivalent to a 2-year study after graduating from the six-year secondary school in China. The EE students were all year 1 students, and all of whom had done the 2-year A-level study after graduating from the 5-year secondary school in Hong Kong. This showed that all the participating students had achieved almost the same academic attainment since their schooling. Since these two groups of students could only communicate with each other in either Putonghua or English and they were in the same age group, the situations had provided the needed platform for this comparative study.

During the thirteen-day camp, all activities were carried out on group basis; with two students from China and one student from Hong Kong were put in the same group. The program included English learning classes and tests, Putonghua learning classes and tests, individual presentations, sports, shopping, industrial visits, sightseeing, staying with peers' families, debate, meeting and mini-project competition.

Activities and Purposes of the Study

On the first day of the camp, all students attended the first English attainment test, which included basic grammar, Chinese to English translation, English to Chinese translation, comprehension and writing skills. A second test, with the same areas as the first one, was held again for all students one day prior to the end of the camp. Between the two tests, three 3-hour English learning sessions were conducted, and they were "Pronunciation" and "Misuses of English by Chinese". Of course, the purpose of these English sessions was not meant to improve students' ability in English, but meant to share with them the use of English in the normal ways. The two tests were conducted to ensure the consistency of the results, and the aim was to find out the students' weaknesses and strengths in English.

Again on the first day of the camp, all Hong Kong students were tested for the attainment of Putonghua. The test included two parts; one was a presentation in front of all participants, and the other was a peer group discussion. In the presentation, each Hong Kong student was requested to give a ten minutes talk on any kind of subject, and the topics were mainly self introduction, interesting hobbies and local tourism. Each speaker then responded to few questions raised from the floor. In the peer group discussion, the three students in each group discussed and talked about any topics which they shared common interests. After the test, scores were given to each Hong Kong student for his attainment in Putonghua. In each peer group, the two students from China were the language mentors for the Hong Kong students in the rest of the program, they used Putonghua as the only medium of communication for the activities either held in or off the campus. This kind of enforced and environmentally embedded learning model was repeatedly used to drill the Hong Kong students all day long on the use of Putonghua over the next twelve days. By the end of the program, Hong Kong students were tested again for their attainment of Putonghua after the camp. This time the format of the test was different from the first test and more pressure was on the Hong Kong students. Each peer group conducted a fifteen minutes talk in front of all the participants, and then the Hong Kong student of the group responded to questions raised from the floor. Finally, he was requested to brief the audiences about the camp and what he had learned from it. Apart from the individual peer group, scores were given to the Hong Kong student from all participants. The testing areas for both tests were on pronunciation, fluency, use of words and understanding of Putonghua.

Opportunities for both groups of students to communicate and exchange of views/ideas were amble; through many occasions such as laboratory visits, industrial visits, shopping, touring Hong Kong, preparation for a debate, during meals, singing, sports, peer family visits and mini-project competition etc, students were able to mix naturally and had a free atmosphere to better understand each other.

Three 3-hour sessions of mini-project were organized and had been used to test the students' logical thinking, practical skills, understanding of science, co-operation, mentality/maturity and creativity. The seven peer groups were re-organized into four larger groups for the mini-project competition. Each of the four groups was requested to design and build a toy car and students had to make use of the available building blocks, driving mechanism, interface units and microprocessor supports for their designs. The target was to get the car to complete two separate routes in shortest time. The end result of the project work was not important, but it was through this process that we were able to observe the students' performances and behaviors in the aforesaid areas. The other test, which had similar effect, was the debate competition, but this time students were divided into two groups with one as the "for" group and the other as the "against" group. The major difference between these two events was that one involved practical skill and the other was purely hypothetical work.

Results and Their Meanings

Results of the two English tests[1] revealed that both groups of students were very good in the category of translation from English to Chinese. This was probably due to rich of vocabularies, hence students could do the translation easily. For this part Zhejiang students had better Chinese expressions and better handwriting than the Hong Kong students.

On the contrary, in the category of translation from Chinese to English, students' average performance was 30% worse off than the previous category. The major weaknesses were in lack of vocabulary, misuses of words, and confused structures of sentences, both groups of students had similar weaknesses. The main reason contributing to the poor performance in this area was the lack of reading time on English publications; most of the students had literally not spent any time on non-curriculum English materials at all.

Both groups of students had an average score in English comprehension, although HK students had

a slightly better average than their peers did. Apart from the contributing factor as stated in the above paragraph, students were found unable to precisely comprehend the materials and their relate information. The effect would be more pronounced, if the subject matters had been unfamiliar to the students.

Zhejiang students had better performance than their peers did in the category of English grammar. Looking together with the category of writing test, the weaknesses for HK students were more pronounced. They were very weak in using correct grammar and tenses to form sentences, hence the messages were unclear and confusing. Whilst for the Zhejiang students, clearly they had better training in English grammar, and at least rarely made mistakes in simple and short sentences. They committed the same mistakes as the HK students did in writing long sentences; the major mistakes came from incorrectly use of tenses in most of the sentences. The other weakness in writing was the style of sentences; direct translations from Chinese were found in as many sentences as they wrote. Of course the meanings of these sentences would inevitably be ambiguous and confusing, especially to non-Chinese readers.

The biggest reward from the camp to the HK students was the amazing improvement in Putonghua. The results of the two tests[2], before and after the program, showed remarkable improvement in Putonghua for the majority of them. Of course the embedded learning environment was the major catalyst for the learning process, HK students also played a very major role in actively taking part in all the events. Apart from the test results, the improvements could be easily seen from their involvement in debate, project work and meeting. From the self introduction session in the first day of the camp, where they could hardly express any meaningful sentences in Putonghua to the meeting session in the last day, where they could talk freely about their feelings. In fact the results has been anticipated because the department has a strong belief that embedded approach is a proper way to learn a language.

On mini-project work, where required practical skills and sense of engineering, HK students were found superior as compared to their peers. Zhejiang students were good in designing the outlook of the car and some of them were also good in computing programming. But on practical work, they had very little and limited ideas on how to make things work. However, they were quick to learn and responded very well to challenges.

Other observations from this Student Exchange Summer Camp were: (a) Zhejiang students had higher anxiety to learn and were more serious about learning than their HK counterparts; (b) HK students tended to obey rules and were better in time keeping; (c) Zhejiang students had received more thorough education, whilst HK students were only good in technical subjects; and (d) HK students were more independent, whilst Zhejiang students tended to rely on supports from others.

CONCLUSIONS

EE department financed the whole operation of this Student Exchange Summer Camp, and for this reason the student sample could not be too large. The small group size might have affected the accuracy of some investigative results. However, the preliminary results from the targeted activities were found useful and encouraging, which is worth further and wider investigation. The comparative study has revealed many areas, which educators need to pursuit for the betterment of student quality, and more effective teaching methodology. The weak areas, which have been suggested from the study, are:

(a) Poor English communication skills in speaking, understanding and writing. The problems lie in lack of practice and an environment for students to get training.

(b) Insufficient education on sense of responsibility and work attitudes. Many students had shown some degree of lack of commitment because they did not have the concepts of

being responsible and behaving with proper attitudes. Students would not be 100% learning, if they do not get the concepts right in their minds.

(c) Zhejiang students have to strengthen their practical skills and sense of responsibility,

whilst HK students have to strengthen their language skills and be more committed to study.

Further Study

An astonishing fact has been revealed during the camp, the Chinese students had equal, if not better, English standard as the HK students did. But the fact is that the former group of students only started learning English from their first year in secondary schools, while HK students all learned English since their kindergarten years. This area is worth further investigation in the wake of finding a right approach for the teaching and learning of a second language.

With the success that the camp has achieved in Putonghua, a broader study on this embedded approach to help learn English is recommended. Learning in class can only help students to memorize the rules and skills of a language, but an embedded environment can help students to practice and own the results from it.

The other fact also revealed during the camp was that learning an engineering subject could be more beneficial through work base approach. Students were given a project and, through trials and tests, they learned the technology much faster and in a more useful way, which helped them to remember for rest of their lives.

Note 1:Results of English Tests

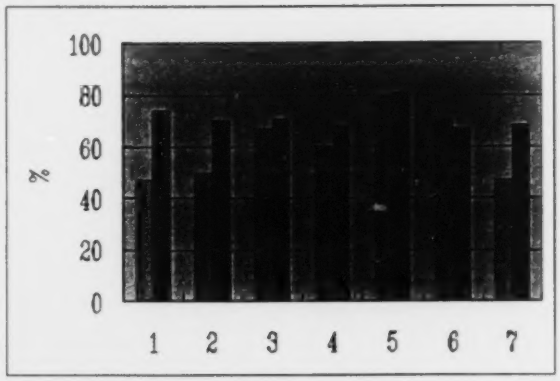
	1	2	3	4	5
	English to Chinese	Chinese to English	Comprehension	Grammar	Composition
HK Stdts	98	68	80	63	66
Zhejiang	100	72	68	77	69

Results of the First Test

	1	2	3	4	5
	English to Chinese	Chinese to English	Comprehension	Grammar	Composition
HK Std	95	64	58	61	65
Zhejiang	97	62	52	71	72

Results of the Second Test

Note: 2 (Test results of Putonghua)



Left: The results of first test in Putonghua

Right: The results of second test

#1 student: Attended 3-year Putonghua in primary school and took a short course

2, 6 & 7 students: Attended 2-year Putonghua in primary school

#3 student: Attended 3-year Putonghua in primary school

#4 student: Parents speak Putonghua, but he never attends any class.

#5 student: Brought up in China, and knows Putonghua

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NEW DESIGNS FOR CAREER AND TECHNICAL EDUCATION PROGRAMS AT THE SECONDARY AND POSTSECONDARY LEVELS IN THE UNITED STATES: CONTEXT, AUDIENCE, SIGNATURE, AND EXPECTATIONS

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Abstract: This paper will address new directions for career and technical (vocational) education in the United States at both the secondary and postsecondary levels of education. The work is a part of the program of work of the new National Center for Career and Technical Education and funded by the U.S. Department of Education. Focus will be on the context of career and technical education (i.e., assets, problems, opportunities, and aspirations), audiences to be served, signature (i.e., unique purpose), and desired learning expectations/outcomes. Special attention will be given to the changes needed in career and technical education in light of major educational reform initiatives at the secondary and postsecondary education levels in the United States. These reforms include new academic standards, integrating vocational and academic learning, more closely linking school and work-based learning, connecting secondary and postsecondary education programs, and new accountability requirements. The first part of the paper will focus on the New Designs for Career and Technical Education project and present a descripiton of the design process and preliminary recommendations resulting from a review of research and best practices and deliberations by a National Design Group representing administrators, teachers, counselors, teacher educators, researchers, and business and industry. The second part of the paper will present an application of the design process and resulting recommendations to a specific career and technical education institution in the United States – Hennepin Technical College.

Part 1: New Designs for Career and Technical Education[1]

The purpose of this project is to develop new designs for career and technical education at the secondary and postsecondary levels in the context of New Designs for the Comprehensive High School (Copa and Pease, 1992; Copa, 1999) and New Designs for the Two-Year Institution of Higher Education (Copa and Ammentorp, 1998). Both of the latter were products of the National Center for Research in Vocational Education at the University of California, Berkeley. These projects were focused on whole high school and community/technical college reform and incorporated the results of research and best practice including integration of academic and vocational education, articulation of secondary and postsecondary education, and coordination of school and work-based learning. With this foundation, it is now appropriate to draw out specific implications for the design of career and technical education in terms such as learning context, learning audience, learning signature, learning expectations, learning process, organization, staffing, partnerships, and learning environment. Both practitioners and researchers will be actively involved the design process.

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[1] This statement was drawn from the ongoing work of the project, New Designs for Career and Technical Education at the Secondary and Postsecondary Levels, which is a part of the program of work of the National Research Center for Career and Technical Education headquartered at the University of Minnesota and funded by the Office of Vocational and Adult Education in the U.S. Department of Education. This project is being directed at Oregon State University, a partner institution in the National Center. The Project Director is George H. Copa, Professor, School of Education, Oregon State University. Sharon Grossbach, President, Hennepin Technical College serves on the National Design Group for this project.

Rationale, Need, and Relevant Literature

The need for this project is clearly evident in the changing context for education and workforce development in the United States. The educational changes include the impact of: (1) new, high priority academic standards across the states for secondary education (U.S. Department of Education, 1992, 1995; U.S. General Accounting Office, 1993; Boesel & McFarland, 1994) (often resulting in a reduction of opportunity and enrollments in career and technical education and a changing role for career and technical education as a pedagogical method for teaching academics in addition to its role as a content area/subject matter field), (2) several years of sustained initiatives and funding for the integration of academic and career and technical education (Bottoms & Sharpe, no date) (often resulting in new forms of career and technical education and multiple and sometimes conflicting expectations for career and technical education), (3) several years of initiatives and funding for School-to-Work system improvement (Stern, Finkelstein, Stone, Latting, & Dornsife, 1995; Hartoonian & Van Scotter, 1996) (resulting in increase attention to work-based learning and linkages to school-based learning with implications for the learning process, organization, and staffing of career and technical education), (4) shifting focus of accountability in community and technical colleges to outcome-based learning with emphasis on the more general education skills (U.S. Department of Education, 1992, 1995; U.S. General Accounting Office, 1993; Boesel & McFarland, 1994) (resulting in concern about the role of, priority for, and organization of career and technical education in postsecondary education), (5) recognition of need for formal lifelong learning and value of transfer of learning (and credit) from high school to community college and community college to university (Hansen, 1994) (resulting in new partnerships in career and technical education), and (6) new vocational legislation (U.S. Congress, 1998) requires states to revisit the definition and meaning of career and technical education in the context of the changes noted above (resulting in widespread conversation and interest in strategies for program improvement and accountability).

At the same time, there are major changes being called for in workforce development in the United States including the need for: (1) new basic skills (Secretary's Commission on Achieving Necessary Skills, 1991, 1992, 1993), (2) broad employability skills (Secretary's Commission on Achieving Necessary Skills, 1991, 1992, 1993), (3) all aspects of the industries (U.S. Congress, 1998), and (4) national industry skill standards (Lee, Casello, May, Foster, Goodwin, & Meeham, no date; Hoachlander & Rahn, 1994; Oliveir, 1995; National Skill Standards Board, 1996). These challenge career and technical education to develop new designs for its learning expectations, learning processes, organization, and finance.

Objectives

The objectives of this project are to:

1. Draw out the implications for career and technical education of the design recommendations of New Designs for the Comprehensive High School and New Designs for the Two-Year Institution of Higher Education and its applications and recognition around the country (e.g., acknowledgement by accreditation agencies as innovative approach to planning institutional improvement, use by the American Institute of Architects as the criteria for selection of award winning K-12 and community/technical college designs, selection of schools applying the design principles as New American High Schools)
2. Conduct a comprehensive review of research and promising practices in career and technical education using a format that can be used by practitioners and easily updated.

3. Involve researchers and practitioners in the development and synthesis of new designs for secondary and postsecondary career and technical education (and the interface between secondary and postsecondary educational levels).
4. Describe new designs for career and technical education in terms of the design elements of learning signature, audience, expectations, processes, organization, partnerships, staffing and staff development, environment, finance, celebration, and accountability.
5. Disseminate and provide technical assistance on new designs for career and technical education.

During 2000, the above objectives will be accomplished for the design elements of Learning Context, Audience, Signature, Expectations, and Learning Process. During 2001 the project will focus on Learning Organization, Partnerships, Staffing, Technology, Environment, Celebration, Accountability, and Finance for career and technical education at the secondary and postsecondary levels.

The contributions of the project will provide new formats and structures for career and technical education in the United States grounded in whole school and college reform and the latest research and promising practices. These new designs will be important and central to the improvement of career and technical education in the United States.

Summary

This part of the paper has provided a description of the design process that is and will continue to be used to develop a new designs for career and technical education in the United States over the next three years. Preliminary recommendations will be provided for the first two of ten design elements – Learning Context and Learning Audience. We next turn to an application of the New Design process (the same elements and general process) which was made earlier to a specific career and technical institution – Hennepin Technical College located in the State of Minnesota. This application and others of the original research and development efforts on New Designs for the Comprehensive High School and New Designs for the Two-Year Institution of Higher Education formed the bases for the new national project, New Designs for Career and Technical Education, as describe above.

Part 2: Hennepin Technical College -- An Application of the Design Process and Resulting Recommendations

Hennepin Technical College is the largest two-year technical college in the Minnesota State Colleges and Universities system of 36 colleges and 53 campuses. Located in suburban Minneapolis, the college was founded in 1972. College programs and services are offered at two campuses and two other locations and hundreds of business and industry sites. Hennepin Technical College enrolls approximately 6,000 post-secondary students, 1,800 high school students, and over 10,000 customized training students annually. The College's revenue budget is $35 million.

The mission of Hennepin Technical College is to provide quality technical education needed for employment in an ever-changing, global work environment. Hennepin Technical College fulfills its mission by offering Associate in Applied Science degrees, diplomas, and certificates in occupational fields that do not require a baccalaureate degree for entry. The College facilitates lifelong learning by offering programs which are specifically designed to expand the knowledge and skills needed by adult learners for job retention, enhancement, or advancement. The College offers flexible and non-traditional evening and weekend classes along with its daytime schedule.

New Designs Planning

During the 1996-1997 school year, a planning process was undertaken to coordinate and support the development of an overall design to continually improve Hennepin Technical College and strategically position it for the future. The planning process lead by the President was done by a design group of 46 individuals who represented key college and community stakeholders. Participating in the group from the college were administrators, faculty, support staff, and students. In addition, over 20 community members served as members of the design group. Another 35 community members were interviewed individually or participated in focus groups. Organization and groups, which were represented, included K-12 post-secondary schools, heads of business and industry, members of labor organizations, interested citizens, and representatives from community-based organizations. The design process addressed Hennepin Technical College's learning context, learning signature, learning outcomes, learning process, learning organization, learning partnerships, learning teams and team development, learning environment, learning finance, and learning celebration.

The Design Group formulated the following design criteria to guide the development of the design specifications for each of the elements that follow in the design process:

- Improving focus on and responsiveness to learners
- Increasing the number and new forms of partnerships
- Improving access to services
- Maintaining and improving dedication and quality of a diverse faculty and staff
- Enhancing public opinion and awareness of HTC
- Identifying and making appropriate investments in core programs/skills
- Improving funding for technical and related training
- Improving flexibility to deal with changing context
- Improving attention to accountability for learning and the institution.

Creating a Change Oriented Culture

"Succeeding at comprehensive changes entails more than thinking and discussing; it requires action" (Eckel, Green, Hill & Mallon, 1999). Eckel et. al. continue by suggesting that for an institution to succeed with change widespread institutional participation must occur. A wide range of people must see themselves benefiting and change must make sense on campus.The New Designs change initiative at Hennepin Technical College has been successful because it has tapped the human resources of the whole college. Collaborative efforts and leadership have produced results.

The implementation of the New Designs began immediately following the release of the design team report in August 1997 at an all-staff workshop. The plan was launched as part of a college learning celebration. Faculty and staff were encouraged to get involved, take risks, and think "outside the box." In 1997 Hennepin Technical College changed its organizational structure to reflect the learning team concept that evolved from the New Designs process. The academic affairs structure formed into learning teams, a more interconnected arrangement with faculty as leaders. The process has taken time, support, and education. The leadership is emerging from all levels and examples of "New Designs" actions are occurring constantly. During the three years HTC has been implementing New Designs the College has become more focused on student learning, strengthened shared values and trust, and invited active involvement in College leadership by all employees.

Summary of Progress

In January and February, 2000 Joyce Simon, Consultant, conducted New Designs workshops that were attended by a total of 85 participants. The sessions were held on both campuses. One of the purposes of the workshops was to review employee perspectives of New Designs and profile root and is growing. It is action, not theory. It has become part of the daily life of the College and the people who work here." (Simon, 2000). Simon also observed that in workshops she conducted 2 years ago she heard fears expressed about what New Designs was "going to do." Now she was finding more of a fear that it would go away and that staff indeed wanted to continue New Designs. Simon concluded from her study that she has observed a remarkable transformation and feels the New Designs approach is here to stay and may become the hallmark for HTC. Her report summarizes the following strengths:

1. The learning teams seem to be working well. Whether groups meet often or infrequently, it seems to be just right for the team members.
2. The president's leadership has been key to making New Designs work. In many organizations, the philosophy is espoused but trust and effort are lacking. Not here.
3. Competition between departments or programs is giving way to cooperation.
4. Team members appreciate having more autonomy. They appreciate being a part of the decision making on team expenditures.
5. The staff throughout HTC system is friendly, helpful, and supportive to colleagues new and old.
6. Key awards (staff recognition) are viewed positively as a means to recognize colleagues.
7. There have been and continue to be technology improvements.
8. Overall morale has improved and is positive.
9. Budget and finance issues are better understood and information is more available than ever before.
10. Staff remains focused on the needs of the students. (Simon, 2000)

The culture at HTC since New Designs has shifted to one of strong trust among all groups of employees. This is especially evidence between administration and faculty. As a result more creative approaches to program offerings have occurred. Risk taking and entrepreneurship is encouraged. Improved technology and more team-work has improved communication within the College and to the external community as well. Training and assistance with technology has also enhanced the work of individual employees.

On Going Opportunities

New Designs has taught the College to listen carefully to internal and external customers. As a result of listening to the needs of internal customers the College is moving ahead to create new tools to continue to implement New Designs thinking. The following guides will be available in August, 2000:

- **New Designs Guide for Better Communications:** the tools available at HTC
- and the best way to use them.
- **New Designs Guide to Marketing:** update on current and planned marketing
- activities, who's who and what's what in HTC marketing.

- **New Designs Guide on Teams:** how to organize and operate a successful team
- **New Designs Guide for Daily Use:** old versus new thinking
- **New Designs Guide for Action:** stirring up results from your ideas.
- **New Designs Guide for Team Participation:** how can I be involved in helping
- HTC reach its potential.

Just as there is no definitive end point to the change process on campus (Eckel, Green, Hill, & Mallon, 1999) this report of New Designs has no conclusion. The challenge now is to sustain the momentum, to keep New Designs fresh and vibrant and to continue to discover the powers and possibilities of continuing the implementations (Simon, 2000).

Hennepin Technical College has moved to new levels of transformational change in the past three years. This change exhibits the dimensions of both depth and pervasiveness. It has touched the college in deep and meaningful ways (Eckel, Green, Hill, & Mallon, 1999).

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DETERMINING WHAT MATERIALS TO DEVELOP

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Index: Curriculum/ Instruction/ Design/ Development/ Learning/ Performance

Abstract: How do you determine what materials to develop? By using a new model that is so efficient and effective, it practically guarantees the production of relevant high-quality CBE materials at the lowest possible cost. The SCID model was carefully developed to incorporate the critical tasks needed to develop the kinds of CBE curriculum and instructional materials needed to train tomorrow's work force today. Twenty-three components—a few optional but most essential—are grouped into five phases: Curriculum analysis, Curriculum design, Instructional Development, Training Implementation, and Program Evaluation.

This model has been used since 1990 to train over 1000 curriculum specialists, and training and development specialists from schools, colleges, companies, and government agencies, domestically and internationally. SCID is a process that works!

INTRODUCTION

The development of curriculum and instructional materials for CBE is a costly and complex process involving many critical tasks. The failure to properly carry out anyone of these tasks can jeopardize the entire instructional development effort. The importance of the process demands that appropriate and effective procedures be used so as to guarantee the production of relevant, high quality materials. Further, the high costs involved require that the most efficient time and money saving approaches available be utilized.

To provide some structure to this very important process, an efficient and effective model has been devised. Known as SCID or the Systematic Curriculum and Instructional Development model, it consists of five phases and 23 components (Norton, 1990). The five-phases are (1) Analysis, (2) Design, (3) Development, (4) Implementation, and (5) Evaluation. See Attachment A for a graphic representation of the model.

Analysis Phase

Analysis is where it all begins. The **needs analysis** component of this phase is where the actual need or needs are determined. The need may be a need for training, for a change in management or production procedures, for new equipment, updated technology, or a combination of these. If the need for training is confirmed, them some type of **job or occupational analysis** is called for. While the observation and interview techniques used to be extensively used to conduct job analysis, today we strongly recommend the DACUM approach to job analysis because of its many benefits and advantages over all other approaches for most situations. Using DACUM, a comprehensive and high quality analysis can be completed in two days rather than 30 or more days required by most methods.

Following the job/occupational analysis procedure, we highly recommend that task verification be conducted. **Task verification** can serve several important purposes. To describe two of them, verification can extend the involvement of a few persons in the job analysis to 50, 100, or more expert workers and/or immediate supervisors of the workers. It can also provide an opportunity to obtain valuable decision-making information such as ratings on the "importance" of each task, the "difficulty of learning to perform" each task, and the percent performing each task.

Given the information available from task verification, we are in a good position to select or deselect, as some industry trainers say, the tasks to be included in the education or training program. We also have valuable information which can guide both the instructional development and instructional planning process.

Now we are ready to conduct **standard task analysis**. Task analysis can take many forms, but when properly done, will yield the explicit and detailed information that is needed to develop relevant and technically accurate learning guides, modules, and other types of teacher and student materials. The task analysis of the selected tasks will serve to identify the steps involved in their performance, the knowledge and attitudes required for successful performance, the performance standards (criteria for success) expected by industry, the decisions the worker must make during task performance, and any safety concerns that may need attention.

Design Phase

As the design phase is started, careful consideration must be given to the type of training or education program desired. What learning principles and concepts will be embraced, and what type of student and teacher learning materials (e.g., learning guides, modules, lesson plans, job aids) will be most effective and cost efficient?

The task performance information collected during analysis is used to specify, in measurable terms, the job skills, knowledge, and attitudes the educational or training program will develop in the learner. Decisions are also made about the type of instructional program to be developed; a fully competency-based one, a more traditional one, or perhaps something in between (Norton, 1988 and Sinnet, et. al,-1990). Decisions also need to be made about the amount of individualization of instruction to be offered, the amount and type of supportive media to be developed.

Measurable learning objectives are developed for each task or group of clustered tasks. Written tests and criterion-performance tests are developed so as to allow for valid and reliable assessment of the learner's reference achievement.

During this phase decisions are also made regarding the training setting or settings most appropriate, student/trainee entry-level qualifications, and the sequencing of learning objectives. The design phase concludes with the preparation of a training plan. The training plan will include information about such things as: (a) the selection and recruitment of learners, (b) the selection and/or training of faculty, (c) instructional facility needs, and (d) the tool, equipment, supplies, and materials needed. The implementation of the training plan begins upon its completion so that the necessary preparations can be made concurrently with the development phase.

Development Phase

The development phase results in the production of whatever instructional materials, including media, were decided upon during the design phase. The materials must be developed so as to help the learners achieve the performance objectives in the most efficient, effective, and economical way possible. Emphasis should be on maximizing the use of existing materials and resources whenever

possible. Teacher/instructor and student/trainee activities are designed using the learning objectives and performance measures developed during the design phase as a foundation to guide the process.

In competency and performance-based programs, the instructional materials typically take the form of competency profiles, learning guides, and/or modules. The more traditional education and training programs usually produce curriculum guides, courses of study, and lesson plans.

In most of the development work done for companies and government agencies, sponsors have elected to develop learning guides. As compared with modules, learning guides are usually smaller, 15 to 30 pages versus 40-60 pages for modules, and therefore, much easier to develop. Learning guides usually refer to one or more external resources while modules are usually self-contained. Both types of learning packages contain performance and enabling objectives, and consist of learning experiences that present information, practice/application activities, self-check/model answers, and conclude with a performance test. They are suitable for individual, small group, or classroom use. See Attachment B for a learning guide graphic illustration.

Whatever the type of materials being produced, it is usually advisable to also produce some type of media. The type of media to be developed will depend on many factors including the resources available, the nature of the learning, the skills of the developers, and the equipment and time available.

Implementation

Implementation involves putting the education or training program into actual operation. Work begins by activating the training plan developed in the design phase. Learners have been recruited, instructors selected and trained, and the availability of facilities, supplies, equipment, and other resources is confirmed.

After pretesting, the training is conducted as planned and learner performance is evaluated with both progress and posttests. Instructor performance is also assessed. The evaluations serve to verify that the learners have achieved the performance objectives and to identify any instructor performance problems that need to be remedied. Formative evaluation data is collected from the students and the instructor and used to make in-course corrections as necessary. The results of instruction are documented in the form of student and instructor performance records. Student/trainee competency achievement profiles are used to report to managers, parents and concerned others.

Evaluation Phase

While formative evaluation was conducted during the course of the instruction, it is extremely important at this juncture to conduct summative evaluation. By gathering data on the overall instructional process, on the program outcomes, student follow-up data, worker productivity data, and cost effectiveness data; evaluation can generate decision-making data to help maintain and improve the education or training program. The summative data collected must be carefully and appropriately analyzed and interpreted. Recommendations regarding the program improvements needed then are made and decision-makers are encouraged to take any necessary corrective actions. Completing the evaluation phase produces the performance data and feedback vital to any education and/or training system concerned with quality management or justifying its existence to management.

SUMMARY

The SCID model represents a curriculum and instructional development process that has repeatedly worked very well for many community colleges, companies, and government agencies. The most frequently developed material has been the learning guide because of its ease of development and effectiveness for individual, small group, or large group use. We suggest you try both the SCID model and the development/use of learning guides.

Norton, Robert E. (1988). Competency-Based Education and Training: Training the Technical Trainers: Issues and Strategies. Manila, Philippines: Vera-Reyes Inc.

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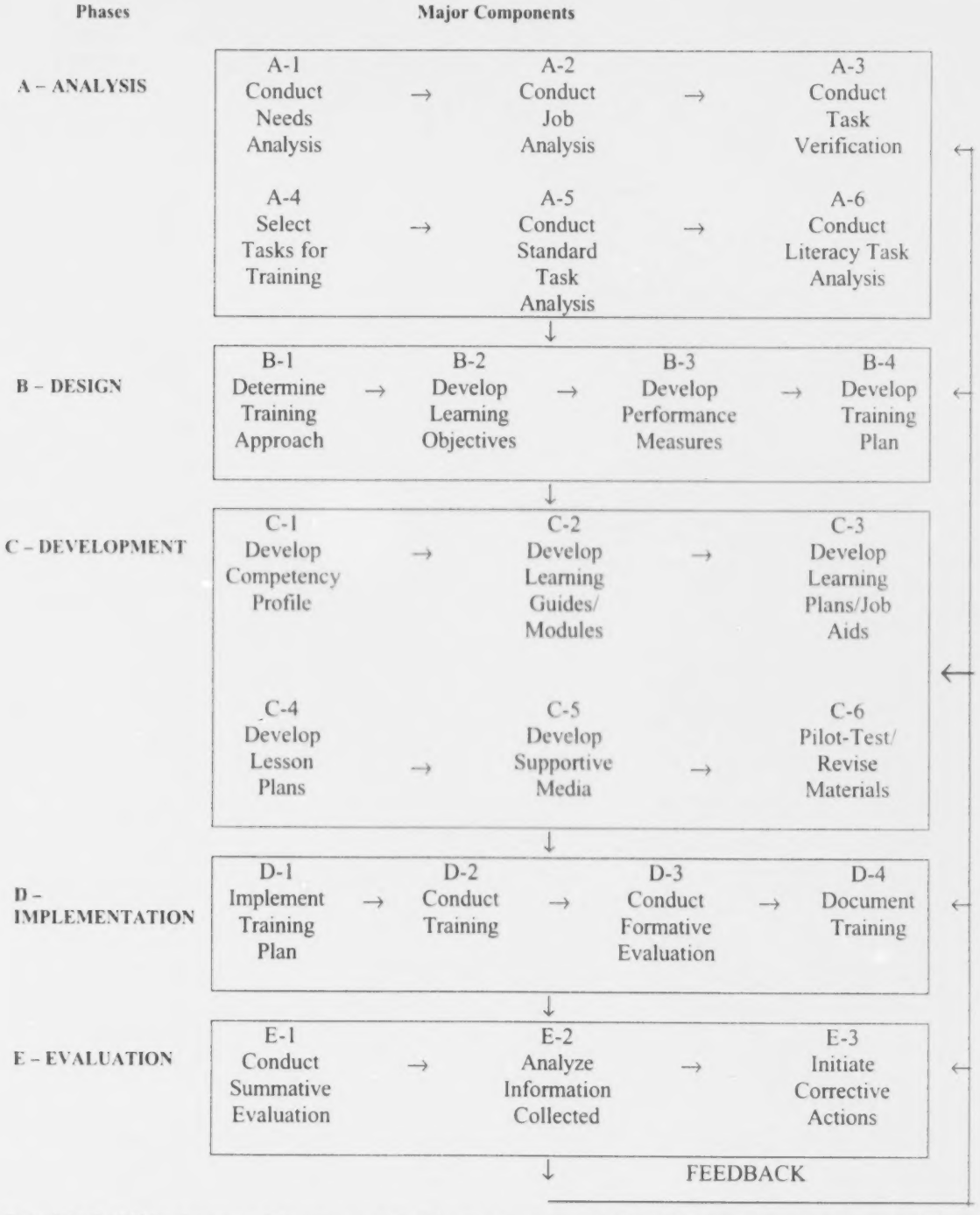
ATTACHMENT A

SYSTEMATIC CURRICULUM AND INSTRUCTIONAL DEVELOPMENT (SCID)



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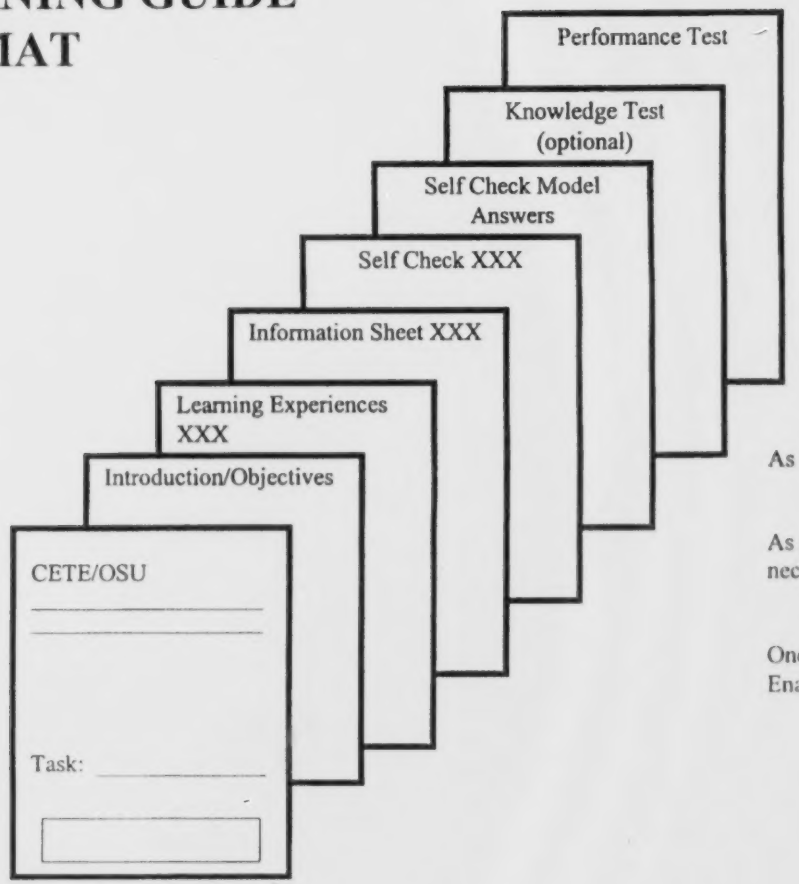
LEARNING GUIDE FORMAT



As many Self Checks as necessary

As many Information Sheets as necessary

One Performance and as many Enabling Objectives as necessary

ATTACHMENT B

DETERMINING WHAT TO TEACH

Dr. Robert E. Norton
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Center on Education and Training for Employment, Ohio State University

Index: Analysis/ Experts/ Duties/ Tasks/ Skills/ Behaviors

Abstract: Managers and supervisors in all work and educational settings need accurate job information to support data-based decision making. The DACUM (Develop A Curriculum) job/occupational analysis process has been used to conduct over 500 workshops for various educational agencies, businesses and industries, and state and federal agencies. It is a very effective, quick and low-cost process for precisely identifying the duties and tasks performed by expert workers. Most trainees are from community college, companies, and government agencies around the United States and more than 25 other countries.

Given an accurate and detailed description of what experts do, a school, college, company or government agency has a solid basis for training others to do the same. One writer described DACUM as a process for "cloning your best workers." In addition to training and curriculum development, the process provides excellent data for management decision-making, career planning, needs assessment, test development, job redesign, performance evaluations, and quality control planning.

INTRODUCTION

How do you determine what will be taught in your education and/or training programs? Is there a big gap between what is offered learners in the classroom/lab and what is going on in the real world of work? Many have estimated the learning gap to be 50% or higher in some programs. Regardless of your setting—school, college, business, industry, or government agency—determining what skills, knowledge, and worker behaviors will be taught is very serious business.

Without an accurate determination of content, two major critical and costly errors are likely to occur. Known as the "Curriculum What Errors" they include failing to teach **what should be taught** (the latest skills and techniques) and teaching **what should not be taught** (outdated skills and information). (Norton, 1997).

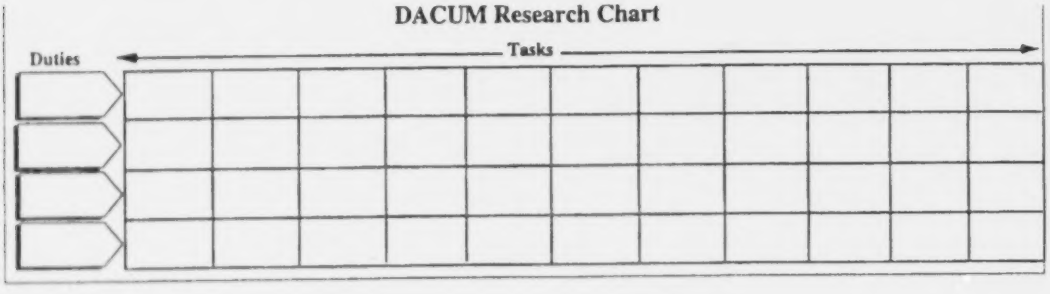
As one can imagine, both errors negatively and seriously affect the student or worker's job preparation. This type of learning gap or inadequacy can jeopardize the individual's employment, affect the company's success, and even reduce the economic well-being of the community.

Fortunately, there is an effective, quick, and low cost process available for significantly reducing the "curriculum what errors" and avoid "cheating the learner." It is called DACUM (Developing A Curriculum).

Quality Instruction for the High Performance Workplace: DACUM

DACUM is an acronym for **Developing A Curriculum** (Adams, 1975). DACUM as used widely today is a unique, innovative, and very effective method of job, and/or occupational analysis. It is also very effective for conducting system and process analyses. The DACUM analysis workshop involves a **trained DACUM facilitator** and a **committee of 5-12 expert workers** from the

position, occupation, or other area of analysis. The profile chart that results from the usual two-day workshop is a **detailed and graphic portrayal of the duties and tasks** performed by the workers involved.



In addition to the development of precise duty and task statements, lists of the general knowledge and skills, worker behaviors, tools/equipment/materials/supplies, and future job trends/concerns are also identified.

DACUM is based on three logical premises (Norton, 1997):

1. **Expert workers can describe and define their job/occupation more accurately than anyone else**. Persons who are working full-time in their positions are the real experts on that job. Even though supervisors and managers usually know a lot about their subordinates work, they usually lack the expertise needed for a high quality analysis.
2. **An effective way to define a job/occupation is to precisely describe the tasks that expert workers perform.** A successful worker performs a variety of tasks that either the customer or employer wants performed. Possessing positive attitudes and knowledge alone are not enough. Hence, finding out what the expert workers (top performers) do will give us the opportunity to prepare other experts.
3. **All tasks, in order to be performed correctly demand the use of certain knowledge, skills, tools, and positive worker behaviors.** While the knowledge, skills, tools, and worker behaviors are not tasks, they are enablers which make it possible for the worker to be successful. Because these four enablers are so important, considerable attention is given during the DACUM workshop to identifying lists of each. Because these attributes are different and distinct from the tasks, it is very important to keep them separate if a high quality analysis of job performance requirements is to be obtained.

DACUM has been used very effectively to analyze occupations at the **professional, managerial, technical, skilled**, and **semi-skilled** levels. It has also been used effectively to conceptualize future jobs, and to analyze portions (selected duties) of one's occupation. Recently, with the increasing emphasis on quality brought forth by the TQM (Total Quality Management), ISO 9000, and QS 9000 movements, DACUM also has been used widely as a basis or foundation for analyzing various industrial systems and processes.

There are many reasons for using the DACUM process. The success of any company or organization is always affected by the quality of its employees. To produce and maintain a highly skilled workforce, schools, colleges, and companies must offer the highest quality of education and training possible to prepare present and future employees for the challenges they face.

Accurate and specific job information is essential to good decision-making in all areas of human resource development and management. All of the approaches to quality improvement and management--TQM, ISO 9000, QS 9000, etc. require participating companies to secure and utilize precise and detailed information about their workers roles and responsibilities--work processes, systems, duties, and tasks. **Job/occupational analysis** is the best method available for collecting that type of information. And DACUM is the best means of conducting job/occupational analysis that is available.

Why is DACUM the best method? The excellent quality of the **product** obtained (results) and the superior process used (committee of 5-12 expert workers interacting) are but two of the many important advantages.

The DACUM methodology is widely used in the United States, Canada, and many other countries simply because it is:

- Highly effective
- Quick
- Low cost

The powerful combination of being very effective, quick, and low cost has made the DACUM process very attractive to many schools, colleges, companies, and government agencies. Another important reason for using DACUM has been and continues to be the strong desire of many trainers and educators to establish a relevant, up-to-date, and localized research base for curriculum and instructional development. Clearly, for **educators** a curriculum base that is soundly determined with maximum input from the businesses who are going to employ the students is needed. For **business trainers** and developers, a curriculum base is needed that is specific to the companies needs and that has been developed in such a way as to obtain strong employee buy-in.

To permit any company or educational agency to identify its own localized research base for curriculum development, an alternative to traditional, time-consuming, and costly approaches to job/occupational analysis was needed. DACUM has become that powerful alternative!

Once employers understand what is to be done via DACUM and how the results will be used, it is a rare employer who will refuse to cooperative. Instead, many colleges who have used DACUM report such reactions as the following:

- Offers of equipment (loans and gifts) and supplies
- Offers to host field trips
- Willingness to provide subject matter experts
- Offers of supportive training materials
- Offers of resource persons to help teach in emerging technology areas
- Requests for inservice training programs to meet local industry needs
- Increased enrollments in adult upgrading programs
- Increased support of the educational institution in a variety of ways by local business, industry, labor, and management

While the public relations value of DACUM is secondary to its main purpose, its significant, long-term impact is too important to overlook or lightly dismiss. Linkages can be developed which, if properly nurtured can be long lasting and extremely beneficial.

Business needs to design new training programs quickly and effectively. The skills and

competencies needed must be job or process specific, if they are to meet the company's production and quality goals. Business needs highly job-relevant training and they must reduce the start-up time and cost for the design and delivery of programs. As one company reported, they cannot afford to spend 30 or more days on an occupational analysis if a two-day DACUM workshop can do the same job better and much cheaper.

Who Uses DACUM?

DACUM is used by:

- **Educational agencies** such as state departments of education, community and technical colleges and institutes, proprietary school/colleges, colleges of education and universities, and secondary schools.
- **Business and Industry** to do all kinds of human resource development and quality management decision-making. Many businesses and industries (hereinafter referred to as businesses) are using DACUM for job and occupational analysis as a basis for training program development, job descriptions, career development, job restructuring, etc. Recently a number of companies have been very successfully using the method with some adaptation to analyze job processes and systems rather than for the more common identification of duties and tasks. Dinah Chesson of Ericsson reports that, "DACUM has proved to be the most efficient and effective means for gathering pertinent job-related information for use in the company's technical training and professional development programs. The internal Ericsson Wireless Communications Malcolm Baldrige Business Assessment Team recently cited the organization's use of DACUM, in training development, as a 'Best Practice'."
- **International Agencies** in over 25 countries have used the DACUM process for education and training program development and updating. User countries include: Philippines, Hungary, Jamaica, Canada, New Zealand, Venezuela, Turkey, Brazil, Malaysia, Singapore, and China.

How is DACUM Used?

DACUM has been and continues to be put to many uses. Some of the most common are presented here under three broad categories.

Management Uses:

- Re-design jobs
- Conduct performance evaluations
- Establish SOP's (Standard Operating Procedures)
- Determine task value added
- Control competency development
- Input to quality planning ISO/QS9000

Training Related Uses:

- Identify training program competencies
- Determine task importance/difficulty
- Assess training needs

- Basis for developing training materials
- Identify performance standards

Recruitment/Placement Uses

- Develop job descriptions (ADA requirements)
- Conduct career planning and development
- Certify occupation competency

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TEACHING EVALUATION - A COMPLICATED ISSUE

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Index: Teaching evaluation, factors, statistics

Abstract: To justify/quantify/qualify on teaching evaluation may be difficult and not objective as there are so much variables. Comparing teaching evaluations obtained by individual lecturer may not be meaningful, as each staff facing independent course with different students, course and other variables (or statistically, each is an independent event and a single mean value must not be compared directly with another).

INTRODUCTION

The City University of Hong Kong has a policy statement about evaluation and the Quality Assurance Committee has also published guidelines. The evaluation schemes are formulated and implemented within the Division of Building Science and Technology and College of Higher Vocational Studies. Theoretically, the schemes are the responsibility of the College. The Centre for the Enhancement of Learning & Teaching (CELT) provides services for processing the Teaching Feedback Questionnaires (TFQ) and Teaching Evaluation and Improvement Packages (TEIP). TFQ is a summative evaluation of teaching performance, whereas TEIP is for formative evaluation which aims at providing teachers with information to improve their teaching.

OBJECTIVES

To review existing teaching evaluation schemes with possible modification for achieving better quality and fairness in teaching evaluation. The term of "teaching evaluation" is hereof defined basically as the assessment of performance of an individual staff member. The Teaching Evaluation Scheme of the College (TES) issued by College of Higher Vocational Studies (CHVS 1996) states that:

a. The Scheme serves 2 primary functions:
   Formative Evaluation for the improvement of teaching; and
   Summative Evaluation for the appraisal and personnel-related assessments
b. Major Teaching Evaluation Tools in Practice are TEIP and TFQ.
c. Evaluation data are only worth collecting if it is used to promote improvement. Students are required to invest significant time evaluating teaching. Their response can only remain serious if the effects of their efforts are made apparent. This will also be true for the staff. It is required that students be given sufficient feedback and that follow-up actions are taken with the staff as a result of teaching evaluations.
d. In practical terms, the TEIP is formative with emphasis on self-evaluation and self-improvement, whereas the TFQ is mostly used for summative purposes. The basic rationale/emphasis on improving teaching seems to have been ignored in the TFQ exercise. Therefore, consideration should be given to the possibility of merging the aforementioned two instruments for the following reasons:
   i) Part A of TFQ is actually formative;

ii) Students, especially first year students are often unable to appreciate the differences between the TEIP and the TFQ;
iii) Frequent filling in of questionnaire fatigues students thus results in that students take the process less seriously.

The suggested new questionnaire (SNQ) should incorporate the essences of the current two forms and more descriptive information should be provided, *e.g.*, marks 1 to 7 may denote VERY POOR, POOR, UNSATISFACTORY, SATISFACTORY, GOOD, VERY GOOD and EXCELLENT respectively. The SNQ therefore will be not only formative and developmental, but also summative and judgmental.

A staff member may conduct the SNQ twice in a course, one at an intermediate occasion and the other at the end. Only the second result will be kept in the record. And the staff member may discuss the result of the first one with the students.

POSSIBLE PROBLEMS AFFECTING TFQ RESULTS

A. Statistics Related Matters

For a large sample size (*i.e.* number of response $n \geq 50$), it probably is reasonable to assume that the random variable of error follows the standard normal distribution (Chen *et al.* 1980, Freedman *et al.* 1998).

Assumptions: For small sample sizes, we have to assume that like most practical problems, the matter of student feedback could be treated as a normal distribution, otherwise the technical problem is beyond the expertise of the taskforce. Furthermore, we have to assume that different sample sizes (student groups, often of different group size) are of identical nature, which is very much questionable statistically and practically, in order to compare between teaching staff members or between courses.

The following discussion will use three examples to illustrate the techniques that are considered suitable for tackling the problems if the aforementioned assumptions are valid.

Example 1 Staff Somebody's TFQ feedback for BST0000 is as the follows:

	Mean ($\bar{u}$)	*Standard Deviation (SD)*	*Number of Response (n)*
Overall Rating	*4.80*	*1.05*	*61*

Find the 95% confidence interval for the result.

Solution:

$\bar{u} = 4.8, \qquad SD = 1.05, \qquad n = 61.$

$$SD^* = SD\sqrt{\frac{n}{n-1}} = 1.05\sqrt{\frac{61}{61-1}} = 1.06$$

The expected value u for the 95% confidence level should fall in the interval of

$$\left(\bar{u} - \lambda\frac{SD^*}{\sqrt{n}},\ \ \bar{u} + \lambda\frac{SD^*}{\sqrt{n}}\right)$$

For degree of freedom N = n - 1 = 60, α = 1 - 95% = 0.05, from the *t*-distribution (Student curve) table:

$\lambda = 2.000$, therefore $(4.53 < u < 5.07)$ for a 95% level of confidence.

Example 2 Staff Someone's TFQ feedback for BST9999 is as the follows:

	Mean ($\bar{u}$)	*Standard Deviation (SD)*	*Number of Response (n)*
Overall Rating	*6.29*	*0.49*	*7*

Find the 95% confidence interval for the result.

Solution:

$\bar{u} = 6.29$, $SD = 0.49$, $n = 7$.

$$SD^* = SD\sqrt{\frac{n}{n-1}} = 0.49\sqrt{\frac{7}{7-1}} = 0.53$$

The expected value u for the 95% confidence level should fall in the interval of

$$\left(\bar{u} - \lambda\frac{SD^*}{\sqrt{n}},\ \bar{u} + \lambda\frac{SD^*}{\sqrt{n}}\right)$$

For degree of freedom N = n -1 = 6, α = 1 - 95% = 0.05, from the *t*-distribution (Student curve) table:

$\lambda = 2.447$, therefore $(5.80 < u < 6.78)$ for a 95% level of confidence.

Example 3 Compare the aforementioned two feedback results with different sample sizes.

Solution:

Step 1:
$$T = \frac{\left|\bar{u}_1 - \bar{u}_2\right|}{\sqrt{SD_1^{\ 2} + SD_2^{\ 2}}}\sqrt{\frac{n_1 n_2 (n_1 + n_2 - 2)}{n_1 + n_2}}$$

where $\bar{u}_1 = 4.80$, $SD_1 = 1.05$, $\bar{u}_2 = 6.29$, $SD_2 = 0.49$ and $T = 26.178$

Step 2: $N = n_1 + n_2 - 2 = 66$, $\alpha = 0.05$ (for 95% confidence level)

From t-distribution: $\lambda = 1.990$

Step 3: If $T > \lambda$, then $u_1 \neq u_2$

i.e. u_2 represents a better result than u_1 does.

(If $T < \lambda$, then $u_1 = u_2$).

Based on the above discussion, we concluded that:

a. From the viewpoint of statistics, the TFQ result is an interval, not a digital figure (Example 1 & 2). Different results have different intervals;
b. Based on Point a, values related to arithmetic average of various TFQ mean expected values ($\bar{u}$), *e.g.* the divisional mean is less significant statistically;
c. To simply compare any two TFQ mean expected values ($\bar{u}$) has little meaning statistically. A proper method for comparison is illustrated via Example 3.

R`ecommendations:

1. The TFQ result should be presented in the straightforward 'interval' format rather than in the 'sample mean + standard deviation' format;
2. A reference point for Divisional standard somewhere below the Divisional median value could be set. A resultant interval around or beyond the set point should be deemed as acceptable.

B. The impact of oral medium of instruction on evaluation results:

The City University of Hong Kong is committed to excellent teaching, which includes using English as teaching medium. Fluency in English will no doubt add weight for students in the keen job market. As known to all, Hong Kong students feel easier and more comfortable in listening to their home dialect Cantonese in class (Actually this argument has been used for the government to promote teaching with mother tongue in primary and secondary schools). In the situation of Cantonese popularizing in class, those teachers who use English as teaching medium will naturally be in a disadvantaged position.

To encourage more use of English in class, we suggest adding one more item in TFQ: Does the teacher use English in class?

_____ 100%, _____75%,_____50%, _____25%, _____None.

100%, multiply 1.2; 75%, 1.1; 50%, 1; 25%, 0.9; none, 0.8. These coefficients will be applied to the overall evaluation (Part B) as encouragement for sticking to the University's official policy on language of instruction.

C. Reliability of Quantified Teaching Evaluation

Up to date, teaching cannot be fully quantified. Staff members feel threatened by the use of students' evaluation as the major measurement instrument to judge their capacity, performance and contribution as a teacher, yet students see little improvement as a result of evaluation. Quantification of teaching needs more detailed research, as teaching mode, role of the particular teaching staff (for example, Course Examiner), class size etc. These variations should be reflected in the calculation of teaching workload. TFQ is vital in stimulating teaching but sometimes produce pressure for teaching staff. For example, strictness to students and persistency in standards may offend students and result in low TFQ. Therefore, TFQ could only be one of the factors in evaluating a teaching staff. The other performance in teaching may also be quantified besides TFQ.

D. Factors affecting feedback of a lecturer's true performance in teaching:

***Nature of course*:** Most learners/students tend to dislike tough (theoretical, abstract, and/or complex) subjects/courses, especially those not closely related to their own discipline/core profession according to their perception. Their inability to learn/absorb effectively from the lecturer would be the ultimate fault of the lecturer, but not themselves (Cashin 1990, Cranton and Smith 1986, Feldman 1978). They may have not paid the effort in devoting to learn hard; instead they put the blame on the lecturer. This may be more severe for new students when they first join the University from post secondary schools, facing a new transition of education system e.g. credit unit system; and just acclimatized themselves into higher vocational training or para-professional courses where they have not studied previously. Most Level one courses are fundamental courses and integrated with Out of Discipline, Chinese Civilization, Language courses which in turn may make their curriculum tougher, posting a negative effect towards teaching evaluation e.g. TFQ. The situation may turn better when they are more accustomed to this mode of study environment in higher/final years.

Maturity of students: It has been argued that majority of the students are not qualified to give feedback on (or to evaluate) lecturers' teaching, as they do not possess necessary knowledge to judge objectively. However, they could, to some extent, feedback on the way a lecturer delivers his lecture/tutorial/studio, etc., but not on the academic standing yet. A serious lecturer may pose a very serious attitude towards lecturing while not smiling nor being humorous. There has been research stating that students tend to like the course when they like the lecturer/style of lecturing, thus may learn better. Each evaluation instrument should be designed for a specific audience and should only include items for which that audience is capable of giving informed responses. Evaluation should be explained to all students. For the elicitation of reliable and accurate results, students should be properly briefed on the purpose of the evaluation before undertaking the questionnaire completion. The overall average score of the TFQ for academic staff is released to students as a reference (CHVS). According to Knapper (1997), it is believed that students who obtain good grades from their teachers are likely to mark their teachers higher and vice versa. Students may not have certain limitation in making fair judgement. There was a perception by some staff members that results on the TFQ largely reflected students' liking of a lecturer, which in turn was fostered by "mollycoddling" students.

Way of teaching: An active lecturer who employs lively teaching methods together with his friendly, humorous, open-minded, helping character (not sacrifice on academic matters to students) may score more positive feedback from students. Alternatively, a tough/blunt lecturer who is not easy-going or being difficult to approach by his students may score more negative feedback. Students tend to find the easiest way to pass or obtain high marks in a course, without spending too much time/effort. A lecturer will have to (or bound to) make their learning more convenient and effective, in order to obtain positive feedback/better TFQ results. Too much or too less notes could be blamed by students. Involvement of too advanced technology in teaching *e.g.* certain computer software where students are difficult to follow, may receive negative feedback. Joint/shared teaching for a particular course may also affect students' marking (being the evaluator in TFQ) for each and every of the lecturers, where one lecturer may teach the tough part of the syllabus while the other(s) may teach the easy part. A responsible lecturer may not be a popular lecturer. To what extent shall we serve/suit/satisfy the students? Shall we treat them only as customers ultimately?

New Course/Old Course: A lecturer who has taught the same course for several times may be more beneficial to a lecturer who teaches new course, as he understands more the syllabus, developed more useful materials and grasped the needs or taste of students. Then he may obtain positive feedback/evaluation from students versus another lecturer who may not possess all these advantages. The latter may end up with negative feedback/ evaluation, especially when facing a transition period of new syllabus under credit unit system, new types of students, *etc*. But a teacher's evaluation for a particular course should not be a one-time practice. It may continue over a period to see the progress if it is allowed practically. Another matter is whether the courses wherein TFQ is conducted should be the choices of the staff member or the management. This will be affected largely by the factors such as teaching of core or non-core, fundamental or practical courses, class size, teaching load, and *etc*.

Bargain: It may be a fallacy that bargains exist between lecturers and students. Students may not truly reflect a lecturer's teaching where they fear that their feedback/evaluation may affect the lecturer's grading, in turn affect their examination grading, or vice versa. There are established mechanism for academic matters/grading e.g. moderation of examination papers/coursework/design projects where a bargain may not be that easy, unless a lecturer is not professional/genuine. A

lecturer who fails many students in a course may still obtain positive feedback/evaluation. Alternatively, will a lecturer who give high marks to many students surely not receive negative feedback or evaluation? There may not be absolute evidence/verdict to prove a bargain exist or not exist.

OVERALL COMMENT

With the forgoing discussion, to justify/quantify/qualify on teaching evaluation may be difficult and not objective with so many variables. Comparing teaching evaluations obtained by individual lecturer may not be meaningful, as each staff is facing independent course with different students, course and other variables (or statistically, each is an independent event).

Those entrusted with using the information from teaching evaluations for decision making related to career progression should be skilled in interpreting and drawing together the difference sources of information.

It has been commented that students receive little feedback from the information which they provide. Students see little improvement as a result of evaluation. Students are overloaded with questionnaires and do not take them seriously. Staff members feel threatened by the use of student evaluation only to judge their capability as teachers. All these factors may have further weakened the degree of trustworthiness of teaching evaluation.

RECOMMENDATIONS

a. TEIP and TFQ should be merged and a new questionnaire developed in the way that it is formative, summative, developmental and judgmental;
b. Resultant data should be presented in the way of an interval format rather than in the 'sample mean + standard deviation' format;
c. A reference point for Divisional standard (perhaps, somewhere below the Divisional median value) could be established. A resultant interval around or beyond the set point should be deemed as acceptable.

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PROGRAM QUALITY AND FLEXIBLE MODE DELIVERY: BACHELOR OF HEALTH SCIENCES (*ABORIGINAL HEALTH AND COMMUNITY DEVELOPMENT*): A CASE STUDY

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Abstract: This paper reflects on the issues that have a continuing influence on the development of an academic program that is responsive to the training and academic needs of the developing profession of Indigenous health work. It describes and discusses the influences on the development of the curriculum. It also outlines how an interactive teaching and curriculum evaluation process has been developed to facilitate the monitoring of course content and quality. Part of this process includes an intensive program of block by block student evaluations. These evaluations and the student responses to the Faculty-wide First Year Experience Questionnaire are analysed. The implications for curriculum design and mode of delivery will be discussed.

Responding to the Need

For almost two decades the Faculty of Health Sciences has been a leader in the field; producing graduates trained to provide health worker services for Aboriginal communities. During this period, the training of Aboriginal health workers has evolved from short in-service sessions for health workers on the job, to the development of the present comprehensive training model. This model includes an articulated undergraduate Diploma/Bachelor of Health Sciences (Aboriginal Health and Community Development) and an articulated graduate Certificate, Diploma and Masters program in (Indigenous Community Health). These programs represent academic innovation in the flexible delivery of Aboriginal health sciences programs.

The Articulated Diploma/Bachelor of Health Science *(Aboriginal Health and community Development)*

The articulated Diploma/Bachelor of Health *Science (Aboriginal Health & Community Development)* is a professional Aboriginal Health Worker training program. These courses weave together components of the traditional the face to face semester based on campus teaching model with the characteristics of the distance education approach to higher education. The course is of four years in duration. The first two years comprise the Diploma or Years one and two of the Bachelors program. Students who elect to enroll as Diploma students will graduate with the Dip Health Science. at the completion of year two. Diploma students are offered Automatic entry into year three of the bachelors program..

The challenge

In the absence of established guidelines that a traditional academic discipline or profession might have at the ready, the challenge here has been to develop a health worker training program from the start so. The program development needs to ensure that it ,

1.Will provide the requisite technical skills required of Aboriginal Health Workers

2.Acknowledge that in most cases students enrolment in this program will also be their introduction to tertiary studies and life long learning

3.Acknowledge that students come from various backgrounds and represent diverse communities throughout the Australian continent.

4.Produce graduates who achieve a scholastic standard that is guaranteed by the University's statement of the generic attributes of graduates

5.Contain curriculum content that is both current and relevant for the variety of work situations that fall in the role of the Aboriginal health worker

6.Develop strategies that ensure all students develop a love of lifelong learning

7.Provide students with a flexible course structure through the introduction of an elective mode of learning which enables specialization in professional areas, the development of specific skills, and increases the variety of subject choice

What do Health Workers Do?

The obvious starting point is to examine what skills and abilities are basic to the evolving Indigenous health worker profession. A number of reference points need to be considered. One starting point is The National Competency Standards for Aboriginal and Torres Strait Islander health workers (1996) (NCSATSI). These standards represent one of the first systematic attempts to describe the range of skills and abilities that every health worker who operates at the community level would be expected to have developed.

These standards have now been adopted by the Vocational Education and Training (VET) sectors. They are couched around the central issue of intra-cultural diversity. For example, they state that every community will have a *"unique set of cultural values and traditions, as well as a unique location."* Hence the challenge for all Aboriginal health workers is to mould their practice so that it reflects the needs of their local communities.

The National Competency Standards for Aboriginal and Torres Strait Islander health workers identify the following roles for Aboriginal Health workers: (a)provide direct health services (b) promote wellbeing (c) improve the health of the community.(d) develop strategies to meet the health needs of ATSI communities (e) promote empowerment, (f) have skills to perform and manage a number of different tasks, (g) respond to problems and non-routine events and (h) deal with all the aspects of the workplace including working with others

The Standards are stated in relation to a broad framework that invokes a series of performance streams to describe the activities of health workers. The streams are, Clinical Care, Specific Care, Community Care, Management and Teams, Administration, and Research. The other component of the framework is the concept of varying degrees of task difficulty and requisite skill proficiency skill needed to perform each task listed by the Competencies. The degree of difficulty is described in terms of four levels. Levels A to D. Level A reflects a demonstration of basic proficiency that progressively increases to level D which is meant to reflect a demonstration of an advanced level of skill proficiency.

The limitation with relying on The National Competency Standards for Aboriginal and Torres Strait Islander health workers is that the focus is almost exclusively focused on the practical applications or, *"doing or reactive "* part of the profession. Very little is said about the cognitive skills that one would also expect to be part of the make up of a professional Indigenous health worker. An example of this is illustrated in the following extract from one of the explanatory sections of the introduction to the Competencies (page 1 Intro section 17): *The LEVEL(s) at which this Unit of competency is required by workers: Harder work is usually done by higher level workers. However, it is the GROUP (or "PACKAGE") of units which a worker does that determines the level of the work, 'easier' units may be done by a high level worker in conjunction with 'harder' units. Some units describe work done at many levels. Some units describe work only done at one level.* This extract is an example of the focus that the NCSATSI place on task difficulty.

A further limitation to using only the NCSATSI to evaluate the role of the health worker is that the more complex aspects of Indigenous health work go unrecognised. More importantly the skills are couched in prescriptive language, thus leaving little room for the natural creatively in behaviour that one would expect in a true professional..

What are the attributes of Graduates of the University of Sydney?

A perhaps more comprehensive approach is to expand the concept of competencies to include cognitive and academic skills as well as basic vocational skills. To a large extent this happens at the University of Sydney. The University sets the basic attributes that should characterise all of its graduates. Furthermore it also requires specific application of the generic attributes of graduates to be related in specific terms to each course.

The following table describes the generic attributes of graduates of the Bachelor of Health Science *(Aboriginal Health and Community Development)* graduates. When reading this table one should note that students of this course are training for employment in various settings in Aboriginal health and community development. They are expected to cope with and facilitate change at the individual and the community levels; and will be developing individually, socially and spiritually. Graduates will display the following skills:

Table I. The generic attributes of the graduates of the Bachelor of Health Science

Knowledge skills
Have a body of knowledge in Aboriginal health and community development.
Thinking skills
Be able to exercise some critical judgement, be capable of rigorous thinking, able to account for their decisions, be realistic self-evaluators, adopt a problem solving approach and be creative and imaginative thinkers.
Personal skills
The capacity and desire to continue to learn; The ability to plan and achieve goals in both the personal and the professional sphere, and ability to work with others.
Personal attributes
Strive for tolerance and integrity, acknowledge their personal responsibility for their own value judgements and ethical behaviour towards others
Practical skills
collect, correlate, display, analyse and report observations and apply results of research and systematic observation to new situations; and generate and test questions related to Aboriginal health and community development
Professional skills
Identify factors which impede or promote health in Aboriginal individuals and communities. Communicate effectively with Aboriginal and other people, organisations and communities

The Market

Knowing how the consumers of an academic program feel about their studies is important. At this point it is appropriate to consider what students who are presently enrolled in the course have to say about their reasons for their decision to come to study at university. The data that will be discussed here was obtained from the First Year Experience Questionnaire. Each year the faculty conducts a survey of all first year students using a modified version of the McInnis, C. and James, R. (1995). *First Year Experience Questionnaire,* students are asked to complete the questionnaire in the second week of the second semester of study. Hence, by this stage most students have had the experience of one semester of university study and have developed a reasonable commitment to the course they have enrolled in. Appendix I extracts the results for some sections of this questionnaire that was administered in 1998.

Students (AHCD) were asked to indicate what were the important influences on their decision to study at university. The two most important influences reported by 96% of respondents were, being able to develop talents and creative abilities, and being able to study in a field that held high personal appeal. The need to train for a specific job was identified as being most important by 89% of respondents. The next cluster of responses involved issues such a being with people of a similar culture 68%, and getting a job with a good salary 71%. It is interesting to note that being with friends only attracted positive responses from 28% of respondents and expectations of family had even fewer positive responses at 7 %.

Curriculum Evaluation and Course Development

Melrose (1998) defines curriculum evaluation as "the process by which a judgement is made about the worth or merit of a curriculum or its appropriateness for the individual, the group, the organisation offering it or the society within which it operates." (p37). As this definition suggests the process will be multifaceted. It will focus on issues of immediate interest as well as pin-pointing issues that will have a longer term significance on the quality of the programs on offer. The objectives are to evaluate: (a) the degree of student satisfaction with the study block they are currently attending, (b) determine the level of satisfaction with individual classes that they have attended, (c) test the perception of progress based on the stage of the course students are currently enrolled in, (d) the extent to which expectations have been achieved and (e) the extent of student participation in related aspects of their studies.

Institutional integration

The questionnaire is administered three times a semester (each of the blocks students attend) and is kept in a similar format throughout the year. The questionnaire consists of three components. The first part (Part A) relates to the subjects that are currently on offer. This section asks students to respond to questions that relate to the perception of the effectiveness of the teaching/learning environment. The second component asks students to relate their performance and study to the social and personal environment. Issues such as social and cultural needs are canvassed at this stage. The third part asks students to both identify and comment on what they like most and least about their current academic experiences, as well as inviting the respondents to also suggest improvement. An important part of the process is that issues that were raised and discussed in previous blocks are represented for comment and affirmation. Hence rather than letting issues "go away", issues are brought back in order to check on the extent to which resolution has been achieved.

A note on the selection of questions is that some issues remain relevant throughout the semester, whereas others occur in a temporal context. To reflect this situation some questions remain unchanged throughout the semester, others remain the same in essence but change in tense. For example in the first administration the following question; "*I look forward to further study of this subject...*" would be restated in the next questionnaire as, "*I have continued to enjoy studying this subject...*".

Students complete the questionnaire on the last day of each block. The results are presented to them on the first day back of the next block and the issues generated are discussed at a staff student forum midway through the block. Immediately after students leave a staff teaching /learning meeting is called to discuss and action the results.

Learning Styles

The need to respond appropriately to issues related to student performance, flexible teaching and varying learning styles has been shown to be important to the process of effective curriculum development. Milem, J. F. and Berger, J. B. (1997) Students enrolled in the Diploma/Bachelor of Health Sciences were asked to indicate the frequency of various academic activities. One cluster of questions was focused on learning activities such as attending lectures and note taking. Over 80% of students responded that lectures were a valuable source of learning and stimulated their interest. It is interesting to observe that only 4% indicated that they often borrow lecture notes from friends. On the other hand 50% said that they never do. For the statement "Most subjects are really interesting" 89% agreed. Group work is favoured by the majority of respondents. A total of 64% of respondents say they discuss subjects with other students and reported that they were encouraged by staff to

work in groups. Over 70% believe that class discussions are worthwhile even though 68% of students did say that they were uncomfortable in group discussions. 89% said that they could not do well without attending classes regularly. 75% of respondents said that university has helped them to develop their learning skills. On the other hand 32% said that they had had difficulty adjusting to the university's teaching styles.

Social and institutional integration

Students did express a clear preference for working with members of their culture. Seventy five percent of students reported that they preferred to mix with students of same cultural background. Nonetheless 40% of respondents said that they kept to themselves. However only 14% said that they had not made any friends at University. One of the features of returning to the next block was to link up with old friends. An important and positive note is that 82% of students reported that they regularly seek advice of teaching staff. 50% say that staff are available to discuss my work and 75% say that most academics are approachable. 54% say they really like the atmosphere of campus. Less than 20% of students say that university hasn't lived up to their expectations.

Expectations and Academic Quality?

Nodrvall & Braxton argue that the issue of quality is complex and suggest that a definition of Academic Quality. should 'focus on fundamental course-level, academic processes and describe the quality of such processes in terms of the level of academic demands or rigor expected of students.' They define academic demands or rigour in terms of the level of understanding of course content that is demonstrated by students whilst they are engaged in the learning process. The evaluation process for the Bachelor/Diploma Health Sciences in (AHCD) programs asks students to reflect and comment on their learning experiences during the block that they are currently attending.

Students enrolled in the Diploma/Bachelor courses in Aboriginal Health and Community Development have indicated that they have a very clear idea of why they hare attending college and what they expect to achieve as a result. To a large extent this is so because a large number are already working in the profession. For example, in 82% of cases students have indicated that they know the type of occupation they want to train in. Only 11% are using their enrolment in the course to help them to decide their future. Almost 90% have indicated that they have enrolled in their course to take training to become a Health worker.

CONCLUSIONS

This paper has outlined the important issues that have presented themselves over the period that the Aboriginal Health programs have been constructed. The need has been and still is for the training of health workers who are multi skilled. To provide an effective model for program development three issues have to be addressed. They are to:

1.Identify and teach the core skills

2.Provide training that produces personnel become effect agents of change

3.Ensure that the program is in keeping with the requirements of the faculty.

Like road construction, most of the AHCD program development has occurred simultaneously with teaching. Hence the market and student expectations have been in a state of constant evaluation. The block by block student evaluation program has provided the vehicle to assist and direct program development.

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